RAILROAD GAZETTE

SATURDAY, NOVEMBER 27, 1875.

The Wear of Rails as Affected by their Quality.

(Contributed to the Rail Committee of the American Society of Civil Engineers, in answer to its request for information.)

ASHBEL WELCH, Esq., Chairman Committee of the American Society of Civil Engineers on Endurance, etc., of Rails:

SIR: At the time of the receipt of the circular issued by your committee soliciting information relative to the wear of rails, etc., I was engaged in a similar effort to gather such information, confining my attention, however, chiefly to the question how many tons of traffic at a given speed could be carried by a given kind of rail. This task, which, at the outset, I imagined would be comparatively easy of accomplishment, I soon found almost hopeless, from the fact, which seemed to me surprising, that the railroad companies, with perhaps a few exceptions, kept almost no record whatever of the places and dates at which rails were laid or of subsequent removals or changes of position, while the records of traffic were not made up in such a way as to enable the tonnage passing over any given point to be determined, even were the life of the rails at that point known. When the circular of your committee appeared, I hoped that the more respectful attention that it would command, as compared with my personal inquiries, would elicit the desired information; but as I observed in the very interesting preliminary report which you have published no facts outside of your own experience are given as to this most important point, I was led to resume the task which I had laid aside, and now present to you the few results at which I have been able to arrive, fully aware that they form a most imperfect solution of the question, in the hope that it may lead those having it in their power to secure the necessary data to give such attention to the matter as will at some future day enable the truth in this important subject to be ascertained. And just here, as a rail-maker, I wish to say to those of your body who are railroad men that the responsibility for the poor quality of iron furnished in many cases by the rolling mills rests with the railroad companies for their marvellous lack of attention to the point now in question.

The figures which I have to offer show plainly that a good iron rail will bear fully twice the traffic of a poor one, and yet neither the engineers nor the rail-makers have any adequate knowledge as to the causes of this difference or of the effects resulting from different methods of manufacture; and, as a consequence, the railroad companies are not willing to pay the small difference in cost which a superior method involves.

It would seem that a point so vital as this to the economy of railroad expenses would be among the first to receive the attention of those charged with the maintenance of our roads; but I am quite certain that were this information which you railway engineers alone can furnish imparted to us rail-makers, who at present have no means whatever of verifying our preconceived notions as to what class of material and method of manufacture should produce the most durable rail, our own interests would lead us at once to avail ourselves of it, trusting to results on your roads to warrant us in the additional expense involved.

The figures that I now present are all that I have been able to obtain. I have suppressed none because they did not agree with any opinions of my own, and on the whole I think, considering the different circumstances affecting the wear of rails on different roads, and the different methods which I have been obliged to adopt to get at the results, that they agree remarkably well.

I am aware that my figures are not strictly accurate. I found at the outset that I must not expect that; but I believe them to be not so far from the truth as to be altogether devoid of interest to you.

The endurance of a rail depends not only on the character of the rail itself, but, as I shall show, in an even greater degree on the circumstances under which it is subjected to wear. The kind of fastening employed, the profile and curvature of the road and, above all, the character of the ballast and drainage of the road-bed exert the most important influence on the wear of the rail.

In a paper by Mr. R. Price Williams, read before the English Institute of Civil Engineers, in March, 1866, which forms the first noteworthy attempt, of which I am aware, to investigate this subject, the results are given of the endurance of a considerable number of rails by different makers laid side by side at different points on the Lancashire & Yorkshire Railway. I have plotted the results of these experiments for four kinds of these rails that were laid at the same points in two series of curves; the first grouped to show the life of the same rail at different points, and the second to show the life of different rails at the same point. A comparison of the two, shows that there is a greater difference in the number of tons borne by the same rail at different localities, than in the capacity of different rails at the same place.

Thus the relative amount of tonnage borne by the four kinds of rails compared, was as follows:

LOCALITY.	KIND OF RAIL.			
	we.	Beale's boiler-plate.	Thorneycroft, 'Best.'	Thorneycroft, charcoal-top.
Liverpool	1	1.49	2.14	3.06
Bolton	1	1.	1.	1.42
Hunt's Bank	1	1.	1.82	2.45
Wigan	1	1.20	1.40	1.62
Average	1	1.17	1.59	2.14

While making the comparison of the same rails by locality, the ratios are:

KIND OF RAIL.	LOCALITY.			
	Liverpo'l.	Bolton.	Hunt's Ba'k	Wigan.
Thorneycroft charcoal-top	1	1.52	2.29	2.10
Do.'s "Best."	1	1.53	2.53	2.60
Beale's boiler-plate	1	2.20	2.	3.21
Crewe	1	3.29	3.	4.
Average	1	2.13	2.45	2.98

Showing that while there was a difference in endurance between the poorest and best rails of 1.00 to 2.14, the wear of the same rail at different parts of the road was nearly as 1.00 to 3.00.

It follows from this, that before we can make any fair comparison between the life of different rails, we must know the circumstance under which they were subjected to wear. It follows, also, that we cannot properly compare the results of a few experimental rails laid at a point where they are subject to frequent and careful inspection with results obtained from an average of a whole road. To avoid this source of error I have confined my comparisons almost entirely to the averages of wear over an entire line.

It is assumed throughout that the destructive effect of traffic is proportional to its speed, and hence, for comparison, the traffic is reduced to tons moved at one mile per hour, by multiplying each class by the speed at which it is carried. This assumption may not be strictly correct. The destruction due to impact would, I suppose, be as the square of the speed. That due merely to friction would, however, probably be independent altogether of the speed, and as both these forces operate to wear out the rails in some unknown proportion, we may not be seriously in error in this assumption that the wear is in direct proportion to the speed. The section of the rail of course has an important bearing on its endurance.

It is probable that the strength of section should be considered more with reference to the weight per wheel to which it is subjected than to the total load passing over it.

Locomotives having a weight resting on the driving-wheels unduly great in proportion to the strength of the permanent way would, undoubtedly, wear out the track more rapidly than where a proper proportion was observed, even where the total weight of traffic was the same. The proper form of section having, however, been very fully considered by your committee, I shall do no more in this connection than to give in each case, where it could be obtained, the section of the rail and a general description of the character of the traffic. I find by plotting the data that I have obtained that the curves representing the rate of failure of the rails are in general a reverse curve approximately symmetrical on each side of the point representing the failure of 50 per cent., or, in other words, that as many rails fail with a less as with a greater traffic, and *vice versa*. The angle of slope of this curve depends upon the uniformity of the lot of rails. If they were all precisely alike, they would all fail together, and the curve would become a vertical line.

The capacity of the rails is considered, therefore, as measured by the traffic that suffices to wear out 50 per cent. of the quantity laid.

The first figures that I shall give relate to the wear of the rails on the Philadelphia, Wilmington & Baltimore Railroad. The records kept by the engineer of this road, Mr. S. T. Fuller, to whom I am much indebted for information, exceed in accuracy and value any that I have found elsewhere. It has been his practice for some years past to have every rail numbered, and to keep a record of the date and place of laying, mending and remeving each rail, and from these records he makes up each year a statement of the percentage of each lot of rails remaining in the track. A series of these figures for a number of years enables a curve to be drawn showing very accurately the rate of failure of the rails in question.

The traffic over this road is mainly passenger at a high speed, and is considerably heavier on the section between Philadelphia and Wilmington than between Wilmington and Baltimore—on the latter section there are, however, thirteen miles of single track.

Mr. Fuller gave me a statement of the portions of the road upon which each lot of rails were laid, so that I was enabled to make up the traffic to which each had been subjected and under which the percentage stated had failed. The amount of traffic was more difficult to obtain, but from the mileage of the freight and passenger locomotives, a statement of the average weights of cars and the tons of freight passing over the two portions of the road just referred to, I was able to get a quantity approximately correct, and, for comparison of the different kinds of rails alike exposed to it, sufficiently accurate. The total tonnage of passenger trains was about 1¼ that of freight. The speed of the former was taken at 35 miles per hour, and of the latter at 15 miles.

The passenger cars are heavy, ranging from 36,000 lbs. for 8-wheel to 48,000 lbs. for 12-wheel cars, while the sleeping cars weigh 58,000 lbs. The weight of locomotives and tenders averages about 100,000 lbs., and the weight on driving-wheels about 40,000 lbs.

The maximum grade of the road is 45 feet; radius of sharpest curve, 1,500 feet. The ballast is gravel, well drained, but rather poor in quality and scant in quantity; good ties, and kept in good repair. The rails are joined with the common fish joint, the Pratt fish, the Fisher joint or Trimble joint.

On this road I confined my comparison to four lots of rails, one the poorest, two the best iron rails and one lot of puddled steel-topped rails.

It would, of course, not be proper to give the names of the makers without their consent, but I am at liberty to state that the puddled steel-topped rails were made by the Trenton Iron Works and the iron rails marked "B" by the Bethlehem Iron Company. The iron rails I will designate as A, B and C. These rails all weighed 60 lbs. per yard and were of the sections shown in Fig. 1.

The quantities of each were as follows:

A, 4,668 rails.
B, 1,857 "
C, 5,848 "
Steel-top, D, 3,783 "

The number of millions of tons at one mile per hour borne by each of the iron rails and under which 50 per cent. were worn out was as follows, being in the ratios to that borne by the poorest stated in the final column:

	Millions.	Ratio.
A	218	1.40
B	196	1.26
C	156	1.00

The tonnage borne by the steel-topped rails cannot be given with accuracy, because as yet but 7 per cent. had failed under the heaviest traffic to which they had been exposed. We can only compare them with the iron rails by giving the percentage of each which had failed under the same amount of traffic: viz., 190 millions of tons at one mile per hour. These percentages were as follows:

A 38
B 47½
C 60½ } Per cent. of failures under 190 million tons at one mile per hour.
Steel-top 07.4

Or we may compare the number of tons which in each case caused the same percentage of failures, which we find to be:

Tons of traffic causing 7.4 per cent. failures.

		Ratio.
A	104.5	2.00
B	75.	1.44
C	52.	1.00
Steel-top	190.	3.65
Average of iron rails		1.00
Steel-top		2.50

This is represented graphically in Fig. 2.

The latter comparison more fairly represents the relative value of the rails, which, calling the poorest unity, would be as stated.

I made no inquiry as to the cost of the several kinds of rails laid in track, but I am quite certain that it bore no proportion to their relative value.

In order to discover, if possible, the causes of the marked difference in the wear of these rails, I endeavored to ascertain from the makers the method employed in their manufacture. I was able, however, to obtain satisfactory information only in the case of the "B" rails and the steel-tops.

The pile for the B rails is as shown in Fig. 3. It will be observed that all the pieces, except one course, are of the full width of the pile and of uniform thickness; the top slab, 9 × 1¼ in., is rolled from the best forge puddled iron; the second slab is rolled from a pile in which the upper half is of the same material as the head piece and the lower half old rails or puddled iron, thus making the thickness of the head iron in the finished rail equal to that due to a head piece 1¼ in. thick or 21 per cent. of the whole pile, though, of course, there must be a certain lack of continuity in this portion due to the weld between the top and second slabs.

The two following slabs, which form the stem, are of old rails or puddled iron rolled into bars 9 × 1¼ in. Next comes a course formed of two flats 4½ × ¾ in., which are the rail ends cut off at the saws flattened down, and, finally, a flange piece of good iron also 9 × 1¼ in.

This is certainly an excellent pile, containing few welds in the final pile, and the slabs being nearly all of uniform thickness, the heating will take place equally throughout. It is somewhat more costly than usual, owing to the fact that nearly the whole pile is of reheated iron, but the wear of the rails appears to warrant the additional cost.

The puddled steel-topped rails were rolled from quite a different pile. Instead of the welds being horizontal, as in the B rails, they were all vertical, as shown by Fig. 4.

As in the preceding case, the flats employed were nearly of uniform dimensions throughout, being, with the exception of a single course of billets, put in merely to enable the roller to distinguish the iron side from the steel, 3¾ and 4 in. × ⅞ in.

The bars shown cross-lined were of the puddled steel, and as they form half the pile, the entire head was of this material, and furthermore no cross-weld occurs in that portion of the rail—a fact which greatly lessens the tendency to lamination by which rails from horizontal piles usually fail. To secure more perfect welds between the bars, these rails were returned to the heating furnaces after having passed through three or four grooves at the rolls and again brought to a welding heat, or, as it is technically called, "wash-heated." This operation, if properly performed, is undoubtedly of great value, and should be more generally practiced. The demand for the cheapest rail, however, prevents it.

The method of piling and heating are, of course, not the only elements that determine the durability of a rail. It is sufficiently well known that the quality of the iron employed has a most important influence. To throw some light on this point, the following analyses were made of the metal forming the heads of the rails in question. The actual samples taken for analysis from the A and C rails, respectively, had borne 281 and 206 million tons at one mile per hour; the C rail, however, having required mending after 129 million tons. The sample steel-top was from a rail having defective flanges and therefore never laid.

	A.	C.	Steel-top.
Phosphorus	.337	.546	.275
Sulphur	traces	traces	....
Silica	.416	.883	.643
Carbon	.099	.096	.075

It will be observed that phosphorus is present in these samples in the inverse order of their merit, and also that the poorest rail contained a very large percentage of silica partly due to slag. The carbon in each is practically the same, showing that it is not so much the absolute quantity of this element that is important as the manner in which it is combined with the iron, the fracture of the steel-top being of a fine grain, while the others were of the ordinary iron fracture.

A *moderate* percentage of phosphorus is probably desirable in the head iron, as it tends to harden it; but with an increase of this element the iron soon becomes weak and brittle.

As a matter of interest the following analysis is here given of the head of one of a lot of 45 lbs. English rails laid in 1836 and taken out in 1868, which probably sustained over 400 millions of tons at one mile per hour—one of those old lots of remarkable quality of which we frequently hear:

ANALYSIS OF FRENCHTOWN 45-LB. RAILS.
Laid 1836; taken out 1868.

Phosphorus	.326
Sulphur	.006
Silica	.320

These old rails were afterward worked into bridge rods of excellent quality.

The next figures which I have to present relate to the results of wear on the Philadelphia & Reading Railroad, and are made up from the total quantities of rails used for renewals for a number of years. They give us, therefore, the average endurance of the rails used on that road, but no information as to the relative value of any particular make.

The method adopted in arriving at these results was different from that employed in the case of the Philadelphia, Wilmington & Baltimore Railroad, being, in short, a comparison of the annual destruction of rails on the entire road with the annual tonnage over the same.

The reports of the company give very complete tables, extending over a period of twenty-five years, containing, first, the number of tons of rails removed and the number relaid each year; second, the total weight carried of each class of traffic moved one mile, and the average weight of trains for each, in each year; third, a grand total of the weight of cars and their loads of every description moved one mile, which serves as a check in making up, in separate classes, the traffic of the road as otherwise given.

It is obvious that the renewals of rails in one year represent approximately the destructive effect of an average year's traffic during the period in which such rails have been in use, and though, from special circumstances, the amount of iron relaid may be exceptionally large or small in any particular year, yet when these figures are taken for a large number of consecutive years they must give exactly the measure of wear caused by the traffic. On this principle, therefore, the facts in this case have been made up based on the reports of traffic from 1850 to 1874, a period of twenty-four years. A certain correction, however, is necessary to allow for the fact that the company have been constantly leasing and incorporating with their road other lines, the iron on which is usually found to require heavy renewals, due to previous traffic, not, of course, included in the reports, and an addition has been made to the traffic to represent this excess, according to the best information that could be obtained on this point.

The class of traffic on this road is very different from that on the one just considered, 75 per cent. being coal traffic, 18 per cent. freight, and but 7 per cent. passenger. The speed for the different classes is taken as 12 miles per hour for the coal, 15 for freight and 30 for passenger.

It is noticeable in comparing the results for the various years that there has been a decided decrease in the endurance of the rails during the period under consideration, the present capacity of the rails being apparently not more than ⅔ of that of the earlier rails, and this notwithstanding that a heavier rail is used than formerly. The present pattern of rail weighs 68 lbs. per yard, and is of the section marked "F" in Fig. 1. At points where the traffic is light a 56 lbs. rail marked "E" is used. The standard section prior to 1871 was the 64 lbs. rail marked "G." The average weight of section during the entire period would be probably 62 to 64 lbs. per yard, and the average weight of traffic which has sufficed to wear them out is 180 *millions of tons* at one mile per hour, a somewhat lower amount than the average for the Philadelphia, Wilmington & Baltimore Railroad.

From Mr. Coxe, the Superintendent of the new rolling mill of the Philadelphia & Reading road, I have received a most interesting statement of the endurance of a large number of sample rails rolled at their works from different irons and from slightly different piles, and laid in the down track of the road opposite the rolling mill at Reading.

In this position 81 per cent. of the traffic is coal, 14 per cent. freight, and 5 per cent. passenger.

The method of manufacture adopted at these works and ac-

cording to which these rails were rolled differs from that in use elsewhere, and the results of the experiments here given indicate that the rails are of excellent quality. It must be borne in mind, however, that these results are for a few rails laid where they were subject to inspection, and we should therefore look for a better result than the average for an entire line.

The pile employed for the rail is, as shown by Fig. 8, 9 in. square, the head piece being 2 in. thick, or about 22 per cent. of the whole. The body of the pile is formed of 3 in. and 4½ in. × 1 in. flats, breaking joints, rolled from a pile of three old rails and four pieces of puddled bar, as shown in Fig. 5. The head piece is rolled from a 9 in. square pile formed of 3 in. and 4½ × 1 in. flats, rolled in turn from a pile 8 in. wide by 6¾ in. high of cold-short, fine-grained puddled bars, so that the iron in the heads is twice reworked before entering the final pile.

The rail pile, Fig. 8, is heated and rolled into a bloom 5 in. high × 6 in. wide on the base, and 5 in. on top, and is then charged into a re-heating furnace and wash-heated, preparatory to the final rolling.

The use of puddled iron with the old rails in the bars for the body of the pile is intended to keep the iron fresh, and insure good welding, while the thorough working of the head iron, and, above all, the wash-heating, should insure an extremely sound rail.

In a number of cases the experiment was made of rolling the pile, Fig. 7, for the heads on edge, so as to bring the welds vertical instead of horizontal. The rails so rolled are designated by the letter "V" in the following table; but the results do not afford any satisfactory information as to which method is to be preferred.

The traffic passing over these rails was given me by Mr. Coxe, in the form of the net load carried of all kinds together. From the data furnished by the annual reports of the company, I have subdivided the traffic into the several classes, added the weights of engines and cars, and multiplied by the assumed speeds.

Designation.	No. of rails.	Iron for Heads.	Tensile streng'h per square in. and character.	Av. tonnage at one mile per hour.
A7B	3	Robesonia: V	58,133: red-short	182,000,000
A×	2	Bethlehem	Tendency " "	267,000,000
A8B	3	Thomas: V		292,000,000
A1	2	Lebanon Valley	63,958: red-short	351,000,000
B	2	Bailey, Lang & Co.	⅛ blister steel mx'd with pig in puddling.	368,000,000
A6	3	Temple	57,043: c'ld-short	408,000,000
A4B	4	Monocacy: V	61,546: t'n'cy "	412,000,000
A6B	3	Temple: V		423,000,000
A7	3	Robesonia		423,000,000
A1B	4	Lebanon V'y: V		426,000,000
S	1	"Excelsior"	Pud'd steel he'd	439,000,000
×	5	Perry Forge	Charc'l bloom rolled into solid head.	445,000,000
A11B	3	Swede: V	54,373: neutral	464,000,000
A10B	2	Chestn't Hill: V	51,709: very cold short	483,000,000
A12B	1	Norristown: V	46,306: very cold short	490,000,000
A3	3	Thomas		496,000,000
A5	1	Leesport	56,612: c'ld short	515,000,000
A5B	2	Glendon: V	65,504: neutral ten'y to c'ld s't	526,000,000
A9B	4	Leesport: V		537,000,000
A5	3	Glendon		575,000,000
A9B	3	Marion: V	44,903: c'ld short	595,000,000
		Average		435,000,000

Steel and steel-headed rails still in use.

Number of rails.	Make.	Character.	Tonnage to date.
3	Barrow	Solid steel	684,000,000
4	Booth	Bessemer steel cap put on cold	684,000,000
10	Butcher	Steel head	684,000,000
4	Amsterdam	Bessemer do	676,000,000
1	Ralston	Codorus do	667,000,000

It will be observed that the irons for the heads of a cold-short tendency gave a better result than red-short irons. Thus the cold-short irons averaging 56,278 lbs. per square inch tensile strength bore, on the average, 498 million tons, while the red-short iron, of 61,046 lbs. average tensile strength, bore but 330 millions tons traffic. It is not true, however, that the weaker the iron the better the rail, but the contrary. The truth appears to be that the iron of hard, granular structure is more durable than the stronger fibrous iron, but that the stronger the cold-short iron the better. Of course, as the steel and steel-headed rails are still in use, their relative value cannot yet be determined; but, as on the other roads, they show a marked superiority.

The remaining instance that I shall give is the wear of over 35,000 tons of puddled steel-headed rails, of the pattern marked H in Fig. 1, 67 lbs. per yard, made by the Trenton Iron Works for the Erie Railway. The manner of arriving at the endurance of the rails in this case differs somewhat from that in the other instances.

The Eastern Division of this road and parts of the other divisions were for a number of years supplied almost exclusively with the puddled steel-headed rails, and it became a matter of interest to determine, if possible, the value of this kind of rail relatively to that of ordinary iron rails.

For this purpose, in the fall of last year, an inspector was sent over the entire line with instructions to take account of every rail bearing the puddled steel mark which was then in track, together with the year in which it was rolled. The number of rails so found was compared with the total number received in each year, and the difference was taken as the quantity that had failed. This would obviously give the most unfavorable result for the rails, because any rails overlooked, out of track, or on which the brand could not be distinguished would be considered as having failed.

The total number of rails inspected was 71,270, and the average life for the rails made in each of the following years was as follows:

Year-mark.	Life in years prior to 50 per cent. failing.
1868.	5.9
1869.	4.7
1870.	4.0
1871.	4.0

The average traffic in the same period over the portions of the road where these rails were laid, made up from the reports of the company with assistance of a detailed traffic statement, issued during a portion of the time, giving with great accuracy the traffic over the different divisions of the road and of what it consisted, was as follows:

Year-mark.	Million tons moved at one mile per hour during period in which 50 per cent. wore out.
1868.	463
1869.	355
1870.	320
1871.	331
Average.	367

The kind of iron employed and method of manufacture were varied somewhat in the different years, which accounts for the differences in the endurance: usually, however, a pile of bars laid horizontally and a wash-heated head-piece were used. The steel for those made in 1868 was made largely from car-wheel iron furnished by the company, and appears to have stood better than that made in the other years.

From a similar inspection of the road made in 1872, the life of the iron rails laid in track was found to be 188 million tons.

The puddled steel-headed rails, therefore, have in this case shown just double the capacity for wear that the iron possess.

In the paper of Mr. R. Price Williams, before referred to, and also in one of a later date by Mr. C. P. Sandberg, there are a few data as to the life of certain rails on English roads. The instances are, however, so few and the circumstances, such as form of section, character of traffic, etc., so imperfectly given, that I have not thought it worth while to introduce them here in detail. Mr. Williams instances rails of English double-headed pattern, 80 to 82 lbs. per yard, bearing from 201 to 498 million tons. Mr. Sandberg gives the endurance of 70 62 lbs. experimental rails of different makes laid under shunting traffic at Camden Town as 135 million tons, while a lot made in the method adopted for the best of these experimental rails, wash-heated and probably 80 lbs. pattern, bore in the main line of the Great Northern Railway 309 million tons. He concludes that 220 millions may be taken as a fair average.

When we consider the excellent character of English roadbeds and their mild winters, we cannot consider these results as indicating a very superior class of iron.

Now the point, it seems to me, of all these results is simply this: Here are on every road iron rails wearing one and a-half to twice as long as others, yet the probability is there was but a very trifling difference in the cost of the two. Is it not, therefore, manifestly to the interest of our railway engineers to give this subject the attention that it deserves, so that the conditions that go to produce a good rail may be clearly ascertained and the companies enabled to avail themselves thereof?

Again, on roads of medium traffic is it not economy to lay steel-headed rails, which are here shown to endure two and a-half to three times the traffic of an ordinary iron rail?

For roads of heavy traffic, of course, only solid steel rails are suitable.

I have not undertaken to draw any elaborate conclusions from the facts here presented, nor to determine the precise methods which would give the best rail. I do not consider the few data which I have been able to collect at all sufficient for this purpose. I intend the figures here given rather as an example of the method by which valuable information may be obtained, and I present them chiefly in the hope of stirring up those having it in their power to regulate the records of the railways to see that this information in kept in such shape as to be of use.

One or two points, however, are sufficiently well indicated by the facts here presented to warrant especial mention:

1st. Thorough welding is the most important requisite in a good rail. It is well understood that steel rails owe their superior endurance, not to the greater hardness of the metal, but to the fact that the metal is free from welds, and therefore homogeneous throughout. The nearer, therefore, that an iron rail can be brought to this condition, the longer will be its life. For this purpose, wash-heating is the best means at our command, and in the manufacture of steel-headed rails, as well as of the best iron rails, is employed to great advantage, and should be more generally required.

2d. A granular fracture for the iron forming the head of rails should be preferred to fibrous iron. It is quite possible that this point is closely related to the preceding, since granular irons are known to weld with greater facility than fibrous irons. It does not follow that a weak, cold-short iron is preferable to a strong iron. The former is usually granular, it is true, but the fine-grained iron, or puddled steel, obtained from good pig iron, is far superior.

One point of first importance still remains to be noticed. Granted that a given rail has twice the capacity of another, what is its relative value in dollars and cents to the railroad company? Obviously not double that of the poorer rail. The real cost of a rail depends, of course, upon the original price, including cost of laying, plus the interest on that sum during the life of the rail, less the value of the old rail when removed. The value of old rails being the same for rails of any quality, and the interest on the primary expenditure being not only an important element but varying materially according to the traffic of the road and consequent rapidity of destruction, it is evident that the money value of rails of extra quality is less in proportion than the relative endurance of the rails, and varies according to the amount of traffic passing over the road in question.

My friend, Mr. A. F. Childs, has calculated for me a very interesting and valuable table showing the price that can be afforded for rails of different assumed capacities of endurance by roads having different amounts of traffic per year. The method employed in calculating this table will be found in full in an appendix to this paper. The general principle is as follows:

Considering the cost to a road of rail equipment to be represented by a sum which, if permanently invested at 7 per cent. would be sufficient to keep the road supplied with rails, then the problem is to find what price can be paid for rails of different capacities, so that this sum shall be always the same. Making but the single assumption (which will always be found very nearly correct) that the value of old rails lying in the track is one-half that of a fair quality of new rails also laid in track—that is, including the cost of laying—and calling the value of such a quality of rail which should bear, as I have shown, a traffic of ten million tons at the average speed of 18 miles per hour, unity, he obtains the following values for rails of other capacities on roads having the amounts of traffic per annum specified in the table.

Kind of Rails.	Millions of tons required to wear out the rails at 18 miles per hour.	RELATIVE VALUES. Weight annually passing over the rails in millions of tons of 2,000 lbs., at 18 miles per hour. 1.	2.	3.	4.	6.	8.
Worn-out rails..	0	0.500	0.500	0.500	0.500	0.500	0.500
Iron.....	7½	0.905	0.891	0.886	0.883	0.880	0.879
	10	1.000	1.000	1.000	1.000	1.000	1.000
	15	1.147	1.193	1.210	1.220	1.229	1.234
Steel-headed..	20	1.251	1.345	1.398	1.421	1.446	1.459
	30	1.378	1.606	1.714	1.775	1.843	1.880
Steel.....	40	1.441	1.784	1.965	2.074	2.198	2.266
	50	1.473	1.910	2.165	2.225	2.514	2.621
	Infinite.....	1.505	2.218	2.940	3.664	5.115	6.567

To use the table, multiply the numbers in the column corresponding to the annual traffic of the road by the market value of a fair quality of iron rails (including in this market value all expenses of freight and actual laying in track), the products will be the actual values to the railroad company of rails of the qualities specified in the table, *laid in track*.

The ratios given in the table are represented graphically by Figs. 10 and 11:

A single example will illustrate the use of the table.

On a road having an average annual traffic of one million tons at 18 miles per hour average speed, what is the relative value of an iron rail capable of standing 10 million tons at this speed, a steel-headed rail capable of standing 25 million tons at same speed, and a solid steel rail capable of standing 50 millions tons at same speed?

Referring to the column of the table relating to a yearly traffic of one million tons, or to the curve representing the same, we find that the relative values are as 1, 1.32 and 1.473; and if the value of the iron rail laid in track is $53, then the company could afford to pay for the others respectively $70 and $78.07, less the cost of freight and laying.

On a portion of road having an annual traffic of 8 million tons the respective values would be, or the company could afford to pay for the rails laid $53, $88.50, $138.90.

For the road first supposed a steel-headed rail would probably be the most economical. For the second, it would be folly to lay anything but steel. Only on a road of extremely light traffic would it be economy to lay an ordinary iron rail, such as most of our mills are producing.

Very respectfully, FRED. J. SLADE.

APPENDIX, BY A. F. CHILDS.

On the Comparative Value to a Railroad Company of Rails of Different Quality.

V = the value to the railroad of new rails (in track) of quality such that they will last T years.

O = equals the value of old rails (in track).

W = the annual tonnage of the road
R = the tonnage required to wear out rails of the above quality. } In millions of tons of 2,000 lbs.

$$\text{Then } T = \frac{R}{W}$$

$V - O$ will be the cost of re-rolling the rails (the new rails being supposed to be purchasable at their value to the company, V).

P = the total capital which being once invested would be sufficient to keep the road supplied with rails (supposed to be purchasable for their value V and re-rolled for $V - O$).

$P - V$ would be the balance left after purchasing the rails. Being put out at interest at the rate r per annum, this balance would at the end of T years amount to

$$(P - V).(1 + r)^T$$

The interest at the end of T years would be

$$(P - V)[(1 + r)^T - 1]$$

As this interest must by the above supposition defray the cost of re-rolling, which becomes necessary at the end of T years, we have,

$$(P - V)[(1 + r)^T - 1] = V - O.$$

$$(P - V)(1 + r)^T = P - O \qquad \frac{P - O}{P - V} = (1 + r)^T$$

$$V = P - \frac{P - O}{(1 + r)^T}$$

(1)
$$V = P - \frac{P - O}{(1 + r)^{\frac{R}{W}}}$$

(2)
$$P = \frac{V(1 + r)^{\frac{R}{W}} - O}{(1 + r)^{\frac{R}{W}} - 1}.$$

A fair quality of iron rails will wear out under a total tonnage of 10 million tons; the average value of old rails may be assumed at one-half the value of such new iron rails (both in track). The average rate of interest on American railroad bonds is 7 per cent. paid semi-annually.

Taking the value of such a quality of new iron rails as unity, we have to determine P.

$V = 1$
$O = ½$
$R = 10$
$1 + r = 1.071225$

$$P = \frac{(1.071225)^{\frac{10}{W}} - .500}{(1.071225)^{\frac{10}{W}} - 1}$$

W being known from the traffic of the road.

Using the value of P thus obtained the equation

(1)
$$V = P - \frac{P - O}{(1 + r)^{\frac{R}{W}}}$$

Or

(3)
$$V = P - \frac{P - .500}{(1.071225)^{\frac{R}{W}}}$$

will give the comparative values on the given road of different qualities of rails by substituting different values of R.

When $R = O$, $V = 0.500$ the value of old rails, as it should be.

When $R = \infty$, $V = P =$ the value to the railroad of rails, which would never wear out. This agrees with the original definition of P.

The following table is thus obtained:

Table Showing the Comparative Value to a Railroad Company of Rails of Different Quality.

Kind of Rail.	Tonnage required to wear out the rails R ‖	Annual tonnage of the railroad W = 1	2	3	4	6	8
Worn out rails....	0	.500	.500	.500	.500	.500	.500
Iron Rails.....	7½	.905	.891	.886	.883	.880	.879
	10	1.000	1.000	1.000	1.000	1.000	1.000
	15	1.147	1.193	1.210	1 220	1.229	1.234
Steel headed....	20	1.251	1.345	1.398	1.421	1.146	1.459
	30	1.378	1.606	1.714	1.775	1.843	1.880
Steel rails.....	40	1.441	1.784	1.965	2.074	2.198	2.266
	50	1.473	1.910	2.165	2.325	2.514	2.621
A rail that would never wear out P.....	∞	1.505	2.218	2.940	3 664	5.115	6.567

The formula used above may also be obtained as follows:

V = the value to a railroad company of a ton of rails that will last T years. This value is made up of two parts,

1st. The value to the railroad company of the use of one ton of rails for T years.

2d. The value of a ton of old rails; this will accrue at the end of T years.

Now put

The value to the railroad company of the use of a ton of rails = the value of the use of P dollars for the same time.

The value of a ton of old rails = O.

From the theory of compound interest,

The value of the use of P dollars for T years = the interest of P dollars for T years payable in advance.

$$= P\left[1 - \frac{1}{(1 + r)^T}\right]$$

The present value of O dollars payable at the end of T years.

$$= O\left[\frac{1}{(1 + r)^T}\right]$$

$(1+r$ being the amount of one dollar put out at interest, at the end of one year.) Hence,

$$V = P\left[1 - \frac{1}{(1+r)^T}\right] + O\left[\frac{1}{(1+r)^T}\right]$$

$$V = P - \frac{P-O}{(1+r)^T}$$

Put R = the tonnage that will wear out the rail,
W = the annual tonnage of the road.

$$T = \frac{R}{W}$$

$$(1) \qquad V = P - \frac{P-O}{(1+r)^{\frac{R}{W}}}$$

The following is an example of the use of the table:

On a railroad where an average weight of 1 million tons annually passes over the rails, it is required to determine the respective economy of the following kinds of rails:

An iron rail, costing $70, laid in track, estimated to stand 10 million tons' wear; a steel-headed rail, costing $80, estimated to stand 20 million tons' wear; a steel rail, costing $100, estimated to stand 30 million tons' wear.

The value of the iron rail being taken as the unit in the table:

The iron rail	is worth $70×1	= $70	costing $70
The steel-headed rail	"	70×1.251 = 87.57	" 80
The steel rail	"	70×1.378 = 96.46	" 100

As compared with iron rails, there would therefore be a gain of $7.57 per ton in using steel-headed rails, and a loss of $3.54 per ton in using steel rails, so that on this road the steel-headed rails would be the cheapest at the prices named.

On a railroad like the Erie, where an estimated weight of 4 million tons passes over the rails:

The iron rail	is worth $70×1	= $70	costing $70
The steel-headed rail	"	70×1.421 = 99.47	" 80
The steel rail	"	70×1.775 = 124.25	" 100

There would here be a saving of $19.47 per ton in using steel-headed rails, and a saving of $24.25 in using steel rails in place of iron. The steel rails would therefore be the cheapest at the prices named.

Fig. 2.

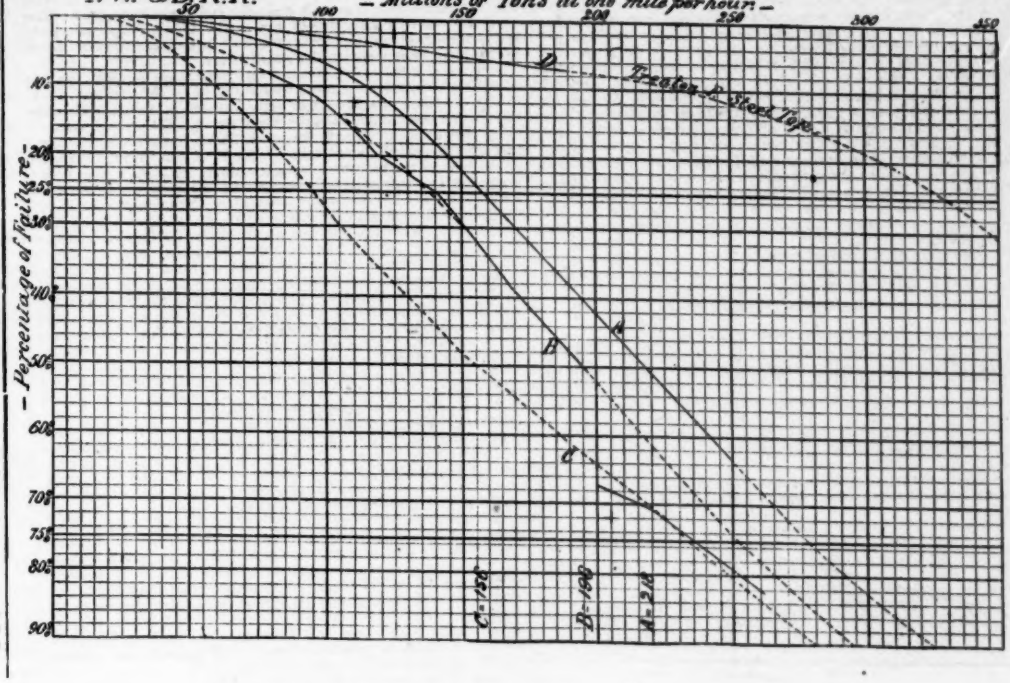


Fig. 9.

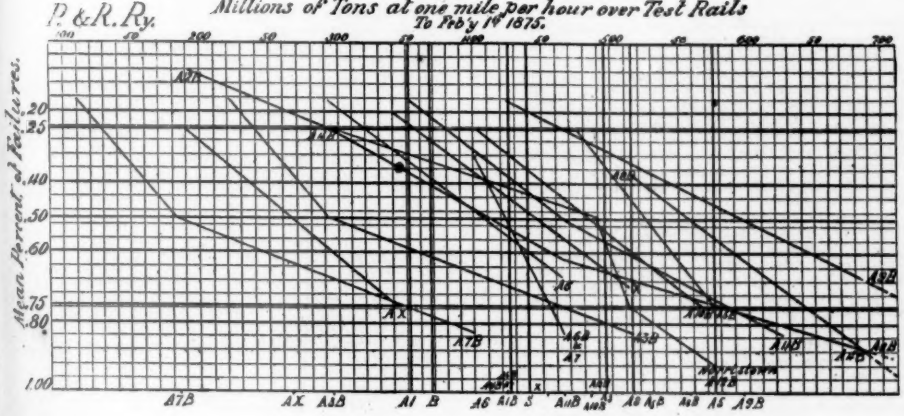


Fig. 10.

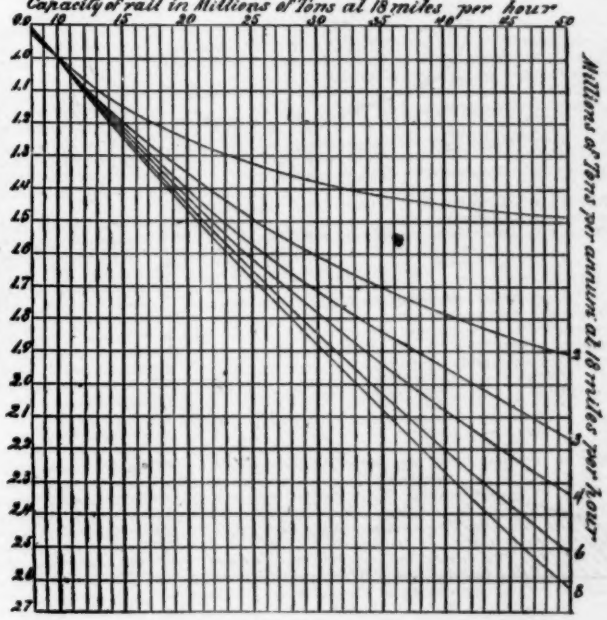


Fig. 4.

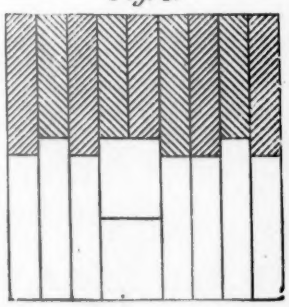


Fig. 3.

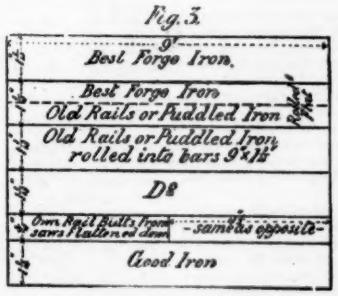


Fig. 5.

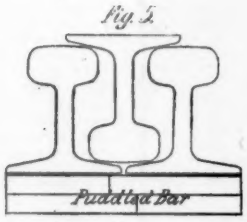


Fig. 6.

Fig. 7.

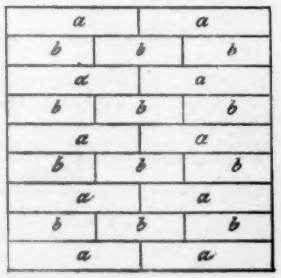


Fig. 8.

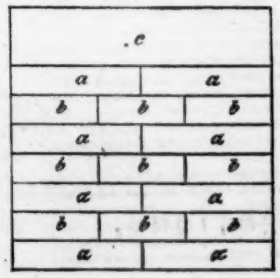


Fig. 11.

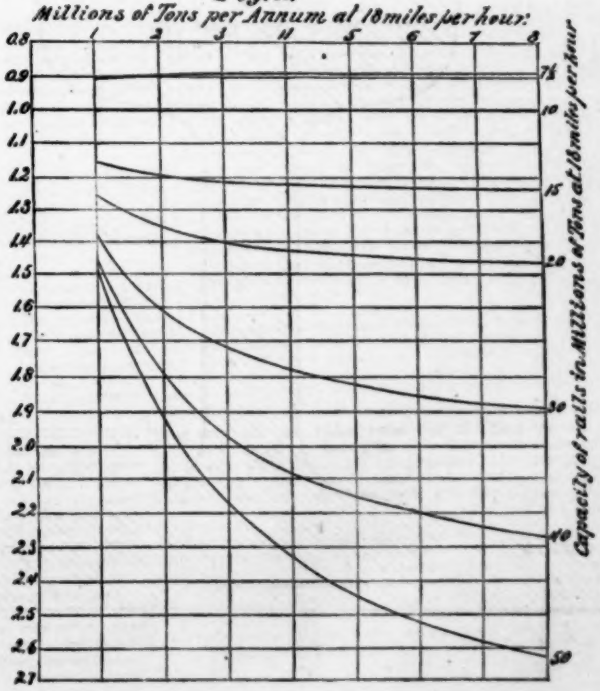
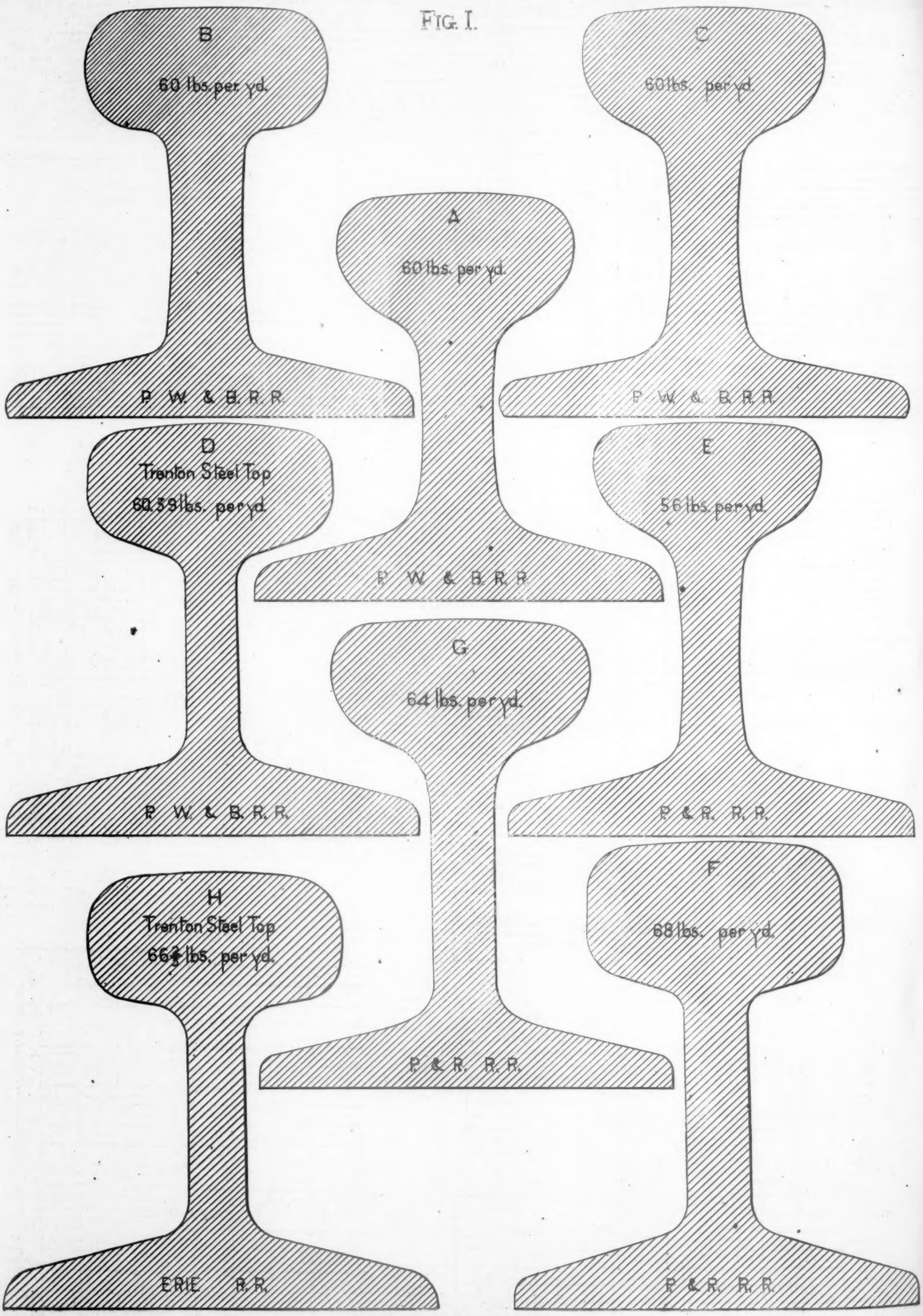


FIG. I.



RAIL SECTIONS,

November Meeting of the Master Car-Builders' Association.

The meeting was called to order, Nov. 18, by President Leander Garey, who said that the subject assigned for this meeting had been postponed until the next, when it was hoped that Mr. Coleman Sellers would be present to address them. The subject for the evening was Freight-Car Couplings, Draw-Bars and Buffers, upon which the Association would be addressed by Mr. W. E. Partridge.

At the conclusion of Mr. Partridge's address, Mr. Garey called for the exhibition of models of buffers.

Mr. Gifford Stevens, of Reading, presented a model for a pin and coupling, which, he said, could be cast to any pattern and could be used with an ordinary draw-bar.

Mr. R. Y. Townsend, of Wilmington, Del., also presented a model which, he said, seemed to answer the purpose. By simply setting it and backing the train, the cars would couple themselves.

Mr. Adams said: Suppose you don't want it to couple?

Mr. Stevens: You can remove the pin, which may be attached to a chain, so as to prevent its being lost.

Mr. Garey suggested that in winter the spring would fill up with snow and ice and would not move.

Mr. Stevens thought the force with which the cars would come together would break the ice.

Mr. Garey here remarked that he had in his mind a little road which used about 17 tons of couplings and pins per month; the proportion is about 7 tons of pins to 10 tons of links. This shows the desirability of dispensing with the loose links and pins.

Mr. Eaton Stone was now called upon to exhibit his model, which he did, describing its features, dwelling especially on its strength. He claimed that, no matter how strong a coupling was, either continuous or automatic, a double link is stronger than a single one. It is very necessary when you have a great number of cars going up a grade on a heavy strain to disconnect those cars, and his coupler would do it. He claimed that buffers and springs are much safer and will resist double the shock placed in the sills when they pass through the sills. Furthermore, a man need not go between the cars, for they can be coupled from the side or the top of the cars.

Mr. Adams was called upon for information on what is required by railroad companies in the way of draw-bars and buffers.

He said that he had no specific facts to present in relation to the repair of draw-bars throughout the country. It was very difficult to get very specific data. The habits and customs of our car-men have not been of the character to present these data accurately. The committee appointed on this subject, in looking over the matter, had made up their minds as to some important points to arrive at in the way of improvements. We have been shown by Mr. Partridge some of the defects in the present arrangement, which had been considered by the Committee. But there were some other things that presented themselves to their minds, and one of the most startling of the whole of them was, the expense of links and pins. Upon some roads this expense was enormous, amounting to anywhere from ten to sixty and seventy thousand dollars a year, according to the size of the road. The ordinary roads perhaps would average $30,000 to $40,000 a year. We need something to couple our freight trains which will enable us to dispense entirely with pins and links. This was one of the points to be striven for. Another point in which we thought there was an absolute necessity for improvement was a greater power of resistance in our buffer springs, and a greater range of motion. Our resistance is altogether below the line of connection. If the springs were made stronger, given more motion, and placed in the direct line of the resistance, the difficulty would be materially obviated.

Various devices have been presented to us during the past year; a good many models have been brought out, and some of them have approximated somewhat to the accomplishment of the idea, but we have not seen any yet that meets our wants, in the opinion of the committee. The thing, after all, is progressing, but yet there is room for improvement. We have got to have a device that will couple freight cars without a link and pin, and in addition to that, a separate buffer placed directly in the line of the frame or bottom of the car, and we have got at the same time to use our present stock; that device must be made to connect itself with our manner of coupling. We have got to use our present stock until it is worn out. But the committee is not as yet prepared to recommend anything. They have not found anything that will entirely accomplish the purpose. A buffer must be so built that it won't couple when you don't want it to. Many inventors seem to think that you must get something that will couple every time it strikes.

There have been but few models that seemed to embody the idea to dispense with links and pins, but I think we shall have to make it in two parts, a separate buffer and a separate hook, because we want our connections to be in the floor of the car. Mr. Stone in his model has accomplished considerable towards it, and I have no doubt he may be able to bring it perhaps to something near what we want.

There is also a model here from Dubuque that has some very good features, but it lacks some important points. I am told that it has been used practically on some roads, and has been indorsed by some prominent railroad men.

Mr. Partridge, who had sketched the model of the coupler last referred to on the blackboard, here explained the patent, and remarked, incidentally, that, whatever they adopted for the method of coupling, whether they separated the buffing from the drawing apparatus, the continuous draw-bar could just as well form a part of the new apparatus as not. As yet, no plans had been submitted to which the continuous draw-bar was not applicable.

Mr. L. Garey said that it was easy to find fault and difficult to apply the remedy. The necessity for improvement in the attachments by which cars are coupled together has been felt for a great number of years, and it was still evident that the improvements had not been got. The necessity of these improvements was shown by the immense number of patents granted year after year. The real necessities are, an automatic coupler with buffing attachments, either connected or another device to be placed on the line of resistance. The buffing requires from one-half to double the resistance of the drawing to make it substantially as strong. Now, if some of our inventors will dispense with the use of the links and pins entirely, provide us with a coupling, automatic or not, which can be uncoupled from cars from the top or side, and give us a buffing attachment which is sufficient for the work, that ought to make a dozen fortunes for him and secure him the blessings of all the people, not only those that travel, but especially the men employed on railroads.

He thought that the railroads would say that out of the cars which were side-tracked for repairs, eight-tenths were owing to some defect in the drawing or attachment. If this could be reduced to three-tenths, it would be a great deal. There was more difficulty from the failures of the attachments than in the draw-bars themselves.

He then asked Mr. Chamberlin to tell what he thought was really required.

Mr. Chamberlin said it seemed to him that we were asking a good deal of the inventors, and when they have made an attempt to produce what we require, we object to it. In the first place, we require them to furnish a draw-bar that shall be automatic, dispense with links and pins, and at the same time a separate buffer, and that buffer shall be on the line of our floor. Now, it has got to be coupled on our old cars. He had studied somewhat on draw-bars, and he did not think any inventor would ever get a draw-bar that would be automatic and couple on our old cars. But he thought that if they would change their cars, an automatic coupler might be got up, practical and economical. There are now in existence several automatic couplers that have considerable merit, but to undertake to couple those with the ordinary draw-bar in existence now would increase our repairs instead of diminishing them.

There are two or three devices in this room now that are perfectly practical, strong and durable, that could be introduced for a trifling cost, and they would pay for the amount we pay for a draw-bar three or four times over in a year. But until it is settled that we shall have an automatic coupler and pay no attention to the old draw-bar already in existence, I don't think we shall advance any. I think I could get up an automatic coupler if I could dispense with the old draw-bar.

Mr. Adams: Inventors say the car-masters and other mechanics ought to invent something for their use.

Mr. Garey: They have not the time.

Mr. Adams: There is another reason. Mr. Chamberlin says he could get up an automatic coupler, but he wants to get rid of the old draw-bar. The master car-builders and mechanics of every description are very seldom inventors, mainly for this reason, or at least it is my reason: that when we go to work to think about such a thing we know what we want, and there are certain rules by which we have to be governed to get that thing accomplished, obstacles that we can't remove, and until something is produced that does remove it satisfactorily to our superior officers, they won't allow us to remove it. We start in and very soon we run against a difficulty, but the difficulties are so frequent and insurmountable that we get disgusted with the thing and give it up. The inventor matures a plan and brings the models in here, and some of them insist that the whole salvation of the railroads existing in the country depends on the adoption of this thing. We pick it to pieces and find the troubles in it. I understand there are at present 1,000 patents in the Patent Office for draw-heads. I presume that 950 of them are good for nothing. I have studied this matter of draw-heads a good deal, and I find that there are a great many obstacles in the way of accomplishing just what we want, and we have very little time to devote to it; but I believe the time is coming when we shall get something that will accomplish the thing. But, as Mr. Chamberlin said, as long as we have got to conform to the line, it is impossible to get an automatic coupler and buffer in the direct line of resistance. Therefore we have got to remove that line of draft and place it in the car.

Mr. Partridge said that speaking of bringing the line of the buffing into the body of the car, and separating it entirely from the line of draft, brought up two late inventions: one invented in this country, another an English patent. He had forgotten the details of the English patent, but made a sketch on the blackboard of the other, and explained its features, saying that it gave a good buffing apparatus in connection with the line of the sills, without in anyway interfering with the cars in ordinary use.

Mr. Eaton Stone remarked, in reference to his model, that it would couple with anything that moved on a railroad where the link is used. He also claimed that the resisting power, or pulling power, was on a perfect line with the line of resistance, or draft. The pulling power is where it should be, according to their standard. He also claimed that his coupler would not couple unless required, and that it was intended to go right into an old draw-head.

Mr. Stetson referred to some couplings which he had on the Erie road 20 years ago, and called upon Mr. Hopkins to explain.

Mr. Hopkins said the same draw-head was now used, with the exception of the coupling arrangement. The bars were made of wrought iron, and the head had a wide mouth and neck which admitted of placing the link at an angle of 45 degrees up or down, so as to couple cars of unequal heights. That draw-head has the self-coupling arrangement, which has proved to possess remarkable qualities of durability. It costs less than an ordinary draw-head. He believed it to be the most effectual combination of cast and wrought iron that he had ever seen.

Mr. Stetson: What was the main reason for abandoning the coupling part of it?

Mr. Hopkins: Nothing except the failure to understand what was necessary by some of those connected with the making of them. He sometimes thought it his duty to remedy that defect and give it to the railways. There was another point he thought quite desirable. Instead of changing the line of the draft, which is now below the timbers, perhaps it may be practicable by changing the line of draft to bring it up on a line with the center of the timbers, and yet working with the ordinary cars by lowering the body of the cars and changing the line of buffing—to which he perceived that his friend Mr. Chamberlain sees serious objections at once.

Mr. Adams: The idea of an automatic coupler, in itself, I do not consider very important. I have had occasion to talk with old train-men a good deal in the last year, and you will find nine out of ten practical train-men that will prefer the old attachment without any arrangement whatever. We have on our road the Curtis coupler, that will couple itself, but they don't like it as well as the other coupler. They have a way of setting that up so as to couple itself. But what the committee wants is not because it is automatic, but because we want to get rid of the pins and links.

Mr. Fletcher presented a model for a coupling which he said was one of the unfortunate ones spoken of there during the evening, for it was automatic. It dispensed with links and pins, was applicable to the stock already on hand, and on the score of cheapness, ease of application and ease of operation he thought it would commend itself to almost any one.

The President asked for statistics of the quantity of links and pins used on railroads, or any other information of the kind which would be valuable or interesting.

Mr. C. E. Garey said he was almost afraid to name the figures there. They had but few cars. As nearly as he could get at the figures, the cost of draw-bars, links and pins per car for the number of cars run for the year ending September 30, 1875, the freight, was only about $3.50. He did not know what to attribute it to, unless they could claim superior stock.

Mr. Varney: I don't agree with all that has been said. Perhaps I am an old fogy. I go for the old dead-weights. I want to get the line of resistance on the body of the car and the old-fashioned dead-weights; bring it there, and they save the draw-bars. You have got to have something to save in getting them out. I use a four-foot dead-weight and have a spring to it which gives about half an inch before they come up solid, and we can have a very heavy bunt and not hurt the draw-bars at all. Within a month we had a train break apart and come together and break 22 draw-bars, which, if they had been on their cars, would not have broken one of them. He doubted that they would ever get what they were talking about—an automatic coupler, and dispense with links and pins, and get something which will couple when you want it to, and not couple when you don't want it to.

Mr. Garey: The New York Central Railroad will use about 200 tons of links and pins a year, about 17 tons a month, and a proportion of about 10 tons of links to 7 tons of pins. He thought the car-builders were so generally unprepared to discuss this subject now, that it would be well to adjourn the discussion to some future time, say the month of February.

Mr. Chamberlin said that their cars had to have links and pins at terminal stations, and they were constantly putting in links and pins, and yet he did not get back one-quarter of the scrap in comparison to the links and pins given out.

Mr. Partridge said he was on a little country road one time and came across the car-builder. Making some remarks about pins, the car-builder said every farmer within 10 miles of the road had one good harrow made of his pins, and some had two, and he said their pins make first-rate harrow-teeth.

He then recalled attention to Mr. Stone's model, and said there was one point about it that was exceedingly important, and that was, uncoupling the train when there was a heavy strain on. There were a good many cases on curves, when you are on grades, when you would like to cut your train in two, when you have got a good many cars on the engine. With that coupling, a comparatively slight strain will do it. By that arrangement the engineer, without leaving his cab, can take off the line and pull it with one hand with sufficient force to cut himself away from his train. There are many cases where that is particularly valuable. The stopping of an engine is a heavy strain on the brakes, and if the engineer can feel perfectly certain of breaking loose with his engine he can save the train from being wrecked.

On motion, the discussion of the subject of couplings, etc., was postponed until the February meeting, and the Association then adjourned.

ANNUAL REPORTS.

Grand Trunk.

The report for the half year ending June 30 covers the entire system of 1,377 miles worked. The earnings for the half year were as follows:

	1875.	1874.	Inc. or Dec.	P. c.
Gross earnings	£909,075	£1,008,561	Dec. £99,486	9.9
Discount on American currency	15,927	9,019	Inc ... 6,908	76.7
Earnings in gold	£893,148	£999,542	Dec. £106,394	10.6
Working expenses	701,460	782,002	Dec... 80,542	10.3
Net earnings	£191,688	£217,540	Dec.. £25,852	11.9
Gross earnings per mile	649	726	Dec.. 77	10.6
Net " "	139	158	Dec.. 19	11.9
Per cent. of expenses	78.54	78.23	Inc .. 0.31	0.4

The balance of net income, after deducting £16,283 postal and military revenue due to the holders of the bonds secured on that class of revenue was disposed of as follows:

Total net income		£175,405
Rent, Atlantic & St. Lawrence	£52,538	
" Lewiston & Auburn	1,542	
" Detroit line	11,250	
" Buffalo & Lake Huron	33,000	
Interest, Bank of Upper Canada mortgage	22,350	
" Montreal & Champlain bonds	12,081	
" First and second-equipment bonds	30,000	
" Perpetual debenture stock	12,500	
		175,261
Balance		£144

There was therefore no balance left to pay interest on the various preference stocks. The continued decrease in earnings results from three causes: 1. The great depression in trade and depreciation in freight rates, common to the whole of the United States and Canada, but principally affecting the lines of communication conveying the produce of the West to the seaboard. 2. The unprecedentedly severe and unfavorable weather during the first three months of 1875. 3. Increased competition, arising principally from the extension of the Baltimore & Ohio line to Chicago, the construction of the Canadian Southern parallel to the Great Western line, and the unfortunate competition by the latter company carried on against the Grand Trunk with great determination and energy, during the early part of the half-year.

One result of the severe Winter was, that in the first three months, with a freight traffic of nearly 18,000 tons less than the previous year, the train mileage was increased by 15, and the engine mileage by 12 per cent., in spite of the fact that the line east of Montreal is supplied with new and more powerful engines since the change of gauge.

The number of passengers carried was 887,176, against 903,425 in 1874; the average receipt per passenger 6s. 1¾d., against 6s. 1d. The freight traffic for the half-year for four years past was as follows:

Half-year to	Tons of freight.	Average distance carried. Miles.	Average rate per ton per mile. Cents.
June 30, 1875	880,221	315	1.07
" " 1874	908,750	299	1.31
" " 1873	772,572	262	1.49
" " 1872	737,361	285	1.42

The remuneration, therefore, for doing the same work—that is, for moving a ton of freight a mile—was, in 1874, 12 per cent. less than in 1873, and in 1875, 28 per cent. less than in 1873 and 18 per cent. less than in 1874.

Considerable reductions have been made in working expenses, and the force of employes has been cut down as far as consistent with safety. The expenditure for maintenance of way amounts to 20¾ per cent. of gross receipts and is still very large, compared with that of other lines. It is hoped that the laying of steel rails and the gradual improvement in the condition of the road will reduce that item hereafter. There is a decrease in every item of expenditure except in taxes and rent of rolling stock.

The new ferry boat at Sarnia is completed, insuring against serious delay in the transfer of cars at that point. The new elevator at Portland will soon be ready for use and will add largely to the company's facilities for grain traffic. The burning of the general offices at Montreal caused a loss to the company of over £7,000 above the insurance.

The report treats at length of the low rates which have prevailed and their causes, and quotes the Michigan Central's last annual report on the same question.

The total charge to capital account during the half year was £299,973. Of this amount £111,130 was for discount on the issue of new capital, exchange, and bankers' commission; £74,709 was the contribution from capital towards the cost of laying steel rails; £24,000 was applied in redemption of 6 per cent. International bridge bonds, and the remaining amount of £90,134 on land purchases, new works and stock, and completing the new ferry boat at Sarnia. The balance chargeable against capital, in respect of steel rails, is £38,900, which will be charged in the December half of the current year, after which no further amount will be expended out of capital for steel rails. During the half year £600,000 of perpetual 5 per cent. debenture stock was issued, the proceeds of one-half being specially set aside for the purchase of certain cars, and the Union Station at Toronto, in accordance with the objects of the "Debenture Stock Act, 1874."

Fast Time on the Erie.

The Paterson *Press* of Nov. 19 says: "The Chicago connection of the Erie Railway, coming East, was two hours and forty minutes late at Salamanca Tuesday night, and the regular express train left nearly on time. Upon the arrival of the Chicago train, a special train was made up. A dispatch was sent along the line of the road ordering all trains to keep out of the way, and to have the road clear. Upon arriving at Port Jervis, the train had made up the lost time to within 53 minutes, and arrived at the Long Dock exactly one hour and fifteen minutes behind the regular express, making the average time the entire length of the road almost one mile a minute. It is the fastest continuous time ever made on the Erie."

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

RAILROADS IN THE LEGISLATURES.

The season is at hand when Congress begins its yearly session and most of the State legislatures assemble. Their meeting, without any doubt, is the occasion of much anxiety to the proprietors and managers of many of our railroads. In many States no session passes without the presentation and urging of some plans of legislation which would destroy a part or even the whole of the value of the railroads of the State, and, unlike proposed legislation on other matters, there is in most States no considerable number either of members of the Legislature or of citizens directly and strongly affected by the injustice of such legislation—not enough, at least, to form an active and aggressive public opinion. Should laws be proposed to reduce the profits of a leading manufacture or of farming, the members introducing or supporting them would be overwhelmed by a storm of indignation, and would be likely, even where those industries are unduly profitable (if such a thing is possible), to be politically dead thereafter, the active opposition of a considerable part of the community of both parties, even though a minority, being sufficient to render them "unavailable" ever after. Thus ordinary industries may rest assured that nothing will be done to injure them directly and openly. If anything is proposed, there are on hand, probably, several members engaged in those very industries, who will fight against such measures as they would fight for their lives, besides many more who will be watchful and earnest to see that their influential constituents receive no detriment. But when the Illinois, or even the New York, legislator advocates a law which amounts to the confiscation of several millions of railroad property, he knows that the number of persons who will be really offended thereby, and resent his action as do those whose means of honest subsistence are abridged or destroyed, will not be very great, that, whatever their wealth and ability, they will not be able to create a public opinion in opposition to him, and that some of his most unjust proposals will actually gain him favor with a large part of the population.

It is for this reason that railroad companies are compelled to watch the course of legislation more carefully, perhaps, than any other industrial interest. What public opinion there is with regard to them is rather hostile than otherwise, and the members of the Legislature and their constituents have usually little direct interest in preventing the oppression of the transportation companies.

We are not complaining of this. It is quite natural. The number of railroad proprietors, especially in the West, is too small to have much political influence, and it is not to be expected that many of them should be returned to the Legislature by constituents whose interests are for the most part quite different. And members of the Legislature are likely to give most thought to the interests with which they are best acquainted, and to those which are urged upon their attention by the great body of their neighbors and constituents. Moreover, the ownership of railroad stocks or bonds by no means makes the holder familiar with railroad affairs. He expects his board of directors and the officers whom they employ to have the knowledge of railroad business necessary to conduct it effectively, and he trusts to them the entire care of his property, including its defense. This defense of late years has largely consisted in warding off attacks made, not against the laws, but through the laws.

For railroad managers to pay no attention to the course of legislation regarding railroad affairs, therefore, would be most culpable negligence. It would be the abandonment of the property entrusted to their care to any who might care to plunder it. The railroad managers are not only its chosen defenders, but they are almost its sole defenders, and, usually, the only persons having the knowledge necessary to a reasonable defense.

The unfriendly legislation proposed usually is of two kinds—that proposed chiefly or solely to gain popular favor, which we find where a considerable part of the community believes that the railroads actually oppress the community; and that brought forward by the class of legislators known as "strikers," which has for its object the obtaining of payments from the railroad companies to prevent the proposed legislation. The latter, in these days at least, is commonest in the more Eastern States, and is itself founded on some supposed popular demand, and the general apathy of those who do not positively favor the measure.

The *pro rata* freight law proposed almost yearly in the New York Legislature appears to be an example of this kind, and the frequent repetition of the attempts to pass it, or rather of the presentation of the bill, indicate that the strikers have found it to pay.

We have indicated, therefore, that the railroad companies would do well to watch carefully the course of legislation in those bodies that have the power to affect their business; and instead of protesting against it, we would urge that this work be done more thoroughly, carefully and intelligently. The members of the Legislature, in most cases, will know very little as to the nature and effect of the railroad bills submitted to their judgment unless the agents of the railroad companies tell them; and although they properly look upon these as *ex parte* counsellors, they will, when really honest, be able to gather some truth from the opposing arguments of those who favor and those who resist proposed railroad legislation.

Now the most effective means of fighting ignorance in legislation is intelligence. When the champion of cheap transportation comes forward with a tariff for fares and freights formed by making a uniform reduction of a fifth or a quarter on the lowest rate previously known on the cheapest road in the State or the country, the representative of the railroad should not be content to say that such a measure would be ruinous to the railroad company; but he should be able to point out why it would be ruinous and just what its effect will be. He should, in short, be able to supply accurate information and the proof that it is accurate. This, alas! too many of our companies cannot supply—at least could not a short time ago. When it was proposed to lower their rates, they could easily see that the effect would be injurious, because they were perhaps barely able to exist with the rates as they were; but when called upon to say how much any given work of transportation actually cost, their replies too often amounted to a confession that they did not know; and when the people and their representatives saw how much ignorance there was among the railroad men, they were easily inclined to assume that they really did not know that the restrictive legislation proposed would do the companies any harm. Now, however necessary it may be or seem to be for the railroad companies to have a skillful politician as their agent, they will make a great mistake if they trust everything to such a man. He may indeed be best able to learn the purposes and plans of the different members and parties; but, however weak or corrupt a Legislature may be as a whole, it is the able and honest members who do most to shape public opinion. If a half-dozen of these are convinced concerning a proposed measure, their convictions may well weigh more with the uninformed public than those of all the rest. Now, able and honest men will be convinced only through the presentation of facts and sound arguments. Thus, whatever other "skilled talent" may be needed, the "skilled talent" of experts in railroad business seems to us to be indispensable.

We believe that there is less disposition than formerly to legislate against the railroads. Perhaps five hundred millions of railroad bonds in default have taught some that railroad business is not always profitable; and probably the disastrously low rates prevailing for two years past have led some to think that the movement for cheaper transportation has been already successful. But in many States the railroads have not only to labor to prevent the evil of new oppressive laws, but to undo the evil of unjust laws already in force—a work of even greater difficulty, especially in a community where all are customers and scarcely any owners of railroads.

Now it seems to us that not only should the railroad companies, when any new legislation concerning them is proposed, impart freely and frankly all information concerning their business, but that they might perhaps gain some favor, and at least aid in providing the most effective bulwark against future unjust legislation, by themselves proposing that laws be passed requiring them to present full and detailed and verified accounts of their condition and operation, their methods of doing business, etc. We suppose that the assumption that railroad transportation is wholly a private business with which the public has no concern is now pretty well exploded. However incomplete the monopoly of railroads, a most important part of their business cannot be conducted with the greatest economy—nor even without great waste—unless it is largely a monopoly, and the public has at least the right to know that it is not oppressed. Moreover, the knowledge needed by the public that it may know that it is treated fairly is the knowledge required by the stock and bondholders that they may know that they are not cheated. Therefore, the publication of full information may be required for the benefit of the two parties whose interests are usually placed in opposition—the customers and the proprietors of the railroads.

The public is accustomed to identify railroad property with its managers, forgetting that usually but a mere fraction of a railroad property is owned by the men who manage it, and that the great body of proprietors are themselves ignorant of the art of working a railroad. Complaint is common that the legitimate profits of railroads are made to appear less by corrupt contracts, extravagant construction and other expenditures and the like. Now, wherever there are such misdoings, the party most injured is not the community but the railroad company itself—the proprietors of the property thus mismanaged by their agents.

Primarily, therefore, a strict accountability of the latter should be required for the benefit of the proprietors. Heretofore, railroad proprietors have received little help in the way of legislation to secure the honest expenditure of their capital in railroad construction, or the proper application of their revenues. The community's lack of direct interest has been shown in neglecting to protect railroad property as well as in attacking it directly; and this has been especially the case with new companies, some of which have been little more than organizations for the purpose of diverting the capital subscribed by capitalists for the construction of a railroad into the pockets of individuals. The community has not only manifested very little sympathy with these ill-treated investors, but, in too many cases, it has passed laws which virtually took all value from the remainder of the property left by the projectors who had the spending of their money.

These much-abused owners of railroad property ought not to remain silent. They may properly appear at the State legislatures and ask at once protection from the men and the communities that have robbed them. And under the circumstances they may ask with some hope; for what they need for their protection is what the public also needs for its protection—the means of knowing the sources of the capital and revenues of the railroads, and just what has been done with the money.

Is Breathing Necessary?

We have, quite frequently—so frequently, indeed, as to incur the charge of having a mania on the subject—urged the desirableness of more attention to car ventilation, and expressed the opinion that the comfort, as well as the health of passengers, would be decidedly increased thereby. We confess that our conviction was based on the assumption that the breathing of reasonably pure air is necessary to all warm-blooded animals, and, therefore, to all men. Now, this assumption is based on an induction from the experience of a large number of human beings and other animals, but is sound only if the fact is general. We know that to many human beings breathing is necessary, and we have felt warranted in believing that this function is indispensable to all; but there are events occasionally that throw doubt on the correctness of the induction, and tempt us to modify it so as to affirm only that breathing is necessary to some men.

We had flattered ourselves, however, that we would not have to withdraw or modify publicly our previously expressed opinion, thinking that those, be they few or many, who exist without air, must be in a half asphyxiated condition, perhaps able to talk intelligibly, but certainly unable to read or write. But this conviction too has been shattered by the following letter, published in the New York *Tribune* of November 18, dated at Wheeling, W. Va., and signed "Traveler":

"Now has come the cold season of the year, when those who travel will desire to do so in warm cars. They will be deprived of this comfort by a long-haired man and a short-haired woman who will clamor for 'ventilation.' The conductors and brakemen will be besought by these fanatics to smother the fires and open the ventilators. Then, too, the young lady with furs, or wearing other thick garments, almost invariably throws up her window, and occasionally some man with a heavy overcoat on does the same thing. I would suggest as a remedy for this evil that railroad companies place on

every train one car supplied with all the ventilators, blowers exhausters and air-holes known to car-builders, and invite to enter it the turbulent persons I have referred to. Ventilators and air-holes of every description should be abolished from cars except a single opening, so arranged that it may be readily closed, at the rear end of each car, as near to the roof as possible. The car, as it passes through the air, leaves a comparative vacuum. This would have the effect of drawing air from the car through the opening mentioned. The air so drawn out must be replaced, and the most closely-fitted windows still leave ample space for air to flow in for this purpose; that is, so far as keeping the air in the cars pure and wholesome is concerned. The opening referred to, however, should generally be kept closed, and so it may be when the lunatics aforesaid are sent into the 'ventilated' car. It will be found that a small car will hold all the passengers of that description on a long train. In warm weather, windows and doors are always open of course, as they should be, so that ventilators are useless at all times."

We desire to modify the proposition of this animal, which evidently exists on carbonic-acid gas and human effluvia, but only so far as concerns the cars intended for air-breathing animals. By all means let himself and his kind have the sort of car he wants, and have the windows locked and the doors kept shut whenever possible. We have no doubt that after a long journey in such a car they would have no complaint to make concerning ventilation, warming—or in fact any other subject whatsoever.

But, seriously, this letter indicates that there is a class of people who are unconscious of—not by any means unaffected by—the effects of vitiated air, and are yet sensible to heat and cold. Infants, physiologists tell us, are not greatly affected by impure air, and other undeveloped, half-torpid animals, with sluggish constitutions, may be really less injured by breathing it than beings normally constituted and fully developed.

Now the complaints of these persons are quite generally plead by railroad men as their excuse for neglecting ventilation. But we beg to call to their attention that these people, though apparently not discommoded by carbonic-acid gas, the excretions of the lungs and skin, and other constituents of second-hand breath (properly ninth, tenth or *n*th-hand breath), do not really object to pure air, while we air-breathers cannot thrive without it. They do not even object to "drafts." You may deprive them wholly of carbonic-acid gas and the fetid smells of a close, crowded room, and they will never complain so long as they are warm enough. You may even keep them in a strong draft of air, and if that air is warm they will not ask to have the window or ventilator closed; the current of air from the register of a hot-air furnace is nothing but a "draft," and these people are very fond of that.

Now we air-breathing animals, as a whole, like warmth about as well as the consumers of second-hand breath, though some of us like pure air better. What we ask for is not pure air and no warmth, nor pure air rather than warmth, but pure air *and* warmth, and we mean to clamor for them until we—or our posterity—get them. It is not so easy to give us these as it is to satisfy the non-breathers by giving them an air-tight car with one small opening at the top of the back end of the car, and that closed, as the Wheeling "Traveler" suggests; but then what we want will not be objectionable to the other class, and really, although perhaps we can no longer claim that breathing is universally necessary, we know that it is necessary for some of us, and we think to most of us. So we shall continue to cry "Ventilate," and the only compromise we can make with the non-breathers is to add a word and cry "Ventilate and warm," and if they insist upon it we will even put it "Warm and ventilate," which is really the proper order of the processes, if not of their relative importance.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

North Brookfield Branch.—Completed from the Boston & Albany at East Brookfield, Mass., north by west to North Brookfield, 4¼ miles.

Utica & Black River.—Extended from Brier Hill, N. Y., northeast to Morristown, 7 miles, completing the road.

Rome, Watertown & Ogdensburg.—The *Lake Ontario Division* has been extended from Kendall Corners, N. Y., west 11 miles.

This is a total of 22¼ miles of new railroad, making 1,150 miles completed in the United States in 1875, against 1,664 miles reported for the same period in 1874, 3,276 miles in 1873, and 6,202 in 1872.

Erratum.

An error occurred in the letter of Prof. Charles A. Smith, printed on page 465 of our issue for November 13. In the second column, beginning with the eighth line from the top, in the sentence reading "If now the strength used for working be 5 tons per square inch," *six* should have been printed instead of five.

A Journey Westward.

II.

While the broad avenues of Philadelphia are always open to receive the stranger, she has also provided one of the most magnificent highways on this continent to "speed the parting guest" who wishes to turn his face westward, and follow the setting sun or "the course of empire." The Pennsylvania Railroad, if not now one of the best managed roads in the country, is certainly in a fair way of soon rivalling and perhaps excelling all its competitors in that respect. This somewhat sweeping assertion is made, because in its management there is an obvious recognition of the value of intelligence, of knowledge, and of education. In order to make this statement perfectly clear, it may be necessary to define what is meant by these words. It is preferred, however, to make the meaning of them plain by illustrations of what was seen and heard while travelling and sojourning along its line. As a first illustration, which must suffice for the present, until others are reached in their consecutive order, it may be mentioned that in travelling from Philadelphia to Harrisburg, it was observed that the brakemen gave careful attention to the ventilation and temperature of the car. On starting from Philadelphia the ventilators were *open*, which is not usually the case. Later in the evening, as there were few passengers in the car, it grew uncomfortably cool. The brakeman then came in, made the fire and closed *a few* of the ventilators. Usually when the latter is necessary, the brakeman or other attendant in charge, with the uncompromising zeal of ignorance, will almost invariably close them *all*, leaving no provision, excepting that which is accidental, for ventilation. The person referred to not only showed discrimination in closing only enough of the ventilators to prevent the car from getting too cool, but when the fire had burned up enough to warm it again he came in and actually opened those which he had closed before. When such an amount of care is shown in training those who are usually in charge of the stoves and the supply of air in cars, and when this class of people actually manifest some reasonable intelligence and discrimination in the regulation of the temperature and the ventilation of cars, why then—the millennium must be approaching, or—the managers of the line referred to must recognize the value of what has been called intelligence, knowledge and education. It should also be remarked here that the same care which was shown in the regulation of the warming and ventilation on the train between Philadelphia and Harrisburg was also afterwards observed in other journeys further westward on this line.

HARRISBURG.

In a pamphlet on "The Industries, Trade and Commerce of the City of Harrisburg," it is stated, as it is elsewhere of many another city and town or "position," that it is "the center of a distinct and independent system of railways, radiating from it through every part of the United States." The Pennsylvania Railroad runs from Philadelphia through Harrisburg, and thence westward to Pittsburgh. The Northern Central starts from Baltimore and passes through Harrisburg and thence northward to Williamsport. The Cumberland Valley extends in a southwesterly direction through the wonderfully fertile valley which gives it its name to Hagerstown, and thence to the Baltimore & Ohio Railroad, and the Philadelphia & Reading runs eastward to the city of Reading. Besides these, several other branches, incompleted or projected roads terminate in the same city, so that it can, with much justice, claim to be a "railroad center." Notwithstanding this, there is not much to interest a "railroad man" there, excepting the shops of the Pennsylvania Railroad and a few manufacturing establishments and iron furnaces.

THE PENNSYLVANIA RAILROAD SHOPS.

These are located at the edge of the city, and consist of two large round engine houses, a machine shop, car and other smaller shops. One round house is for the accommodation of the engines which run on the division between Philadelphia and Harrisburg, the other for those between the latter place and Altoona, which is called the Middle Division. There is very little in these shops different from what may be seen in Altoona, at which place the main shops of the road are located, and also the head quarters of the executive officers of the machinery and other operating departments. The Harrisburg shops, therefore, come under the jurisdiction of Altoona, from which they receive the "motive" of their management. The locomotive department is, however, under the immediate control of Mr. E. L. Caum, Master Mechanic. One feature in the shops is novel. This is a new building which was in process of erection for the accommodation of the scale car and the scale inspector. On this road a person is appointed whose duty it is to inspect all scales on the line of the road every month, and see that they weigh correctly. For this duty he is provided with a car which is supplied with a sufficient number of sealed or standard weights and tools and instruments for testing, inspecting and repairing the scales used for various purposes on the road. It may be remarked here that if scales weigh incorrectly, the railroad company seldom hear of it from those they deal with, if the latter are the gainers by the error; but if they lose thereby, the company soon hears of it. For this reason, any unknown inaccuracy of this kind is almost certain to be a source of loss to the company. It is therefore important to know whether scales do weigh correctly, and it is this kind of "knowledge", among others, that the managers of the Pennsylvania road seem to understand the value of, and which it may also be said many other roads do not.

THE HARRISBURG CAR WORKS.

This establishment is engaged in the manufacture of cars and car-wheels. As in most other similar establishments, its managers complain of dull times. With the exception of an order for box-cars for the Empire Line there are no orders on hand. About 400 men were employed. The shops are substantially built of brick and are equipped with the most improved tools. The office building especially is a model of comfort and convenience. It is a two-story building 41×45 ft. The first floor is devoted exclusively to office purposes. The upper story is divided into four rooms, two for directors' meetings, one for a drawing room and one for general purposes. Both floors are provided with fire-proof vaults, the upper one for storing drawings and the lower one for the books and papers of the corporation. The blacksmith shop is 201×45 ft. and has 46 forges. The machine shop is a two-story building 61×120 ft. The engine and boiler house is 40×80 ft. and has two engines, one of 125 and the other of 50 horse-power. The foundry is 220 ft. long, and is divided into three departments, the machine foundry, the wheel foundry and cleaning and wheel-pit house, besides a core oven 18½×12½ ft. One of the construction shops is 232×60 ft. and another is 200×60 ft., and the framing shop 200×60 ft. Besides these buildings there are a number of other smaller buildings devoted to various purposes. The establishment, taking it altogether, is thoroughly well equipped and prepared to do a large amount of business, which unfortunately cannot be secured at the present time. The Superintendent, Secretary, Treasurer and largest stockholder of the establishment is Mr. W. T. Hildrup.

THE HARRISBURG FOUNDRY AND MACHINE WORKS

is an establishment which was engaged in the manufacture of machinists' tools, but is now idle. It is controlled by the same parties and was in fact at one time a part of the Harrisburg Car Works.

AMERICAN STEEL FROG COMPANY.

This company is engaged in the manufacture of switches, frogs, etc. It is a comparatively new establishment, but has already made for itself a promising business.

THE PENNSYLVANIA STEEL COMPANY.

The works of this company are located at Baldwin, a station on the Pennsylvania Railroad a few miles southeast of Harrisburg. They were erected for the manufacture of Bessemer steel, and are at present engaged in the making of steel rails, forgings, frogs and crossings. It would be impossible to describe these works without devoting more time to their examination than the writer had at his disposal during his visit. The buildings and plant are of the best description that could be designed at the time of their erection. The plant consists o[f]

RAILROAD EARNINGS IN OCTOBER.

Name of Road.	Mileage. 1875.	1874.	Inc.	Dec.	Per c.	Earnings. 1875.	1874.	Increase.	Decrease.	Per c.	Earnings per Mile. 1875.	1874.
Atlantic & Pacific and leased lines	754	754				$488,328	$542,886		$54,558	10.0	$648	$720
Central Pacific	1,315	1,260	55		4.4	1,606,000	1,465,513	$140,487		9.6	1,221	1,163
Cincinnati, Lafayette & Chicago	75	75				38,854	44,668		5,814	13.0	518	596
Illinois Central	1,109	1,109				841,492	838,307	3,125		0.4	759	756
Indianapolis, Bloomington & Western	344	344				131,465	146,958		15,493	10.5	382	427
International & Great Northern	458	458				156,038	147,418	8,620		5.8	341	322
Kansas Pacific	761	761				355,126	358,166		3,040	0.9	467	471
Keokuk & Des Moines	161	161				74,223	71,116	3,107		4.4	461	442
Lake Shore & Michigan Southern	1,175	1,175				1,339,700	1,589,497		249,797	15.7	1,140	1,353
Missouri, Kansas & Texas	786	786				313,374	313,533		159	0.1	399	399
St. Louis, Alton & Terre Haute—Belleville Line	71	71				56,467	65,800		9,333	14.2	795	927
St. Louis, Iron Mountain & Southern	685	685				384,730	357,820	26,910		7.5	562	522
St. Louis, Kansas City & Northern	504	504				263,240	278,106		14,866	5.3	522	552
St. Louis & Southeastern	349	349				104,856	131,865		27,009	20.5	300	378
Totals	8,547	8,492	55			$6,153,833	$6,351,653	$182,249	$380,069		$720	$748
Total increase or decrease			55		0.6				197,820	3.1		

RAILROAD EARNINGS, TEN MONTHS ENDING OCTOBER 31.

Name of Road.	Mileage. 1875.	1874.	In.	Dec	Per c.	Earnings. 1875.	1874.	Increase.	Decrease.	P.c.	Earnings per mile. 1875.	1874.	Inc.	Dec.	P.c.
Atlantic & Pac. and leased lines.	754	754				$3,502,371	$4,199,292		$696,921	16.6	$4,645	$5,569		$924	16.6
Central Pacific	1,304	1,260	44		3.5	14,086,183	11,770,713	$2,315,470		19.7	10,802	9,342	$1,460		15.6
Cincinnati, Lafayette & Chicago	75	75				328,072	372,731		44,659	12.0	4,374	4,970		596	12.0
Illinois Central	1,109	1,109				6,451,154	6,551,342		100,188	1.5	5,817	5,907		90	1.5
Indianapolis, Bloom. & West'n	344	344				1,036,195	1,392,411		354,216	25.4	3,018	4,048		1,030	25.4
International & Great Northern	458	425	33		7.8	977,135	970,601	6,534		0.7	2,133	2,283		150	6.6
Kansas Pacific	761	761				2,711,349	2,763,349		52,000	1.9	3,563	3,631		68	1.9
Keokuk & Des Moines	161	161				686,535	571,906	114,630		20.0	4,264	3,552	712		20.0
Missouri, Kansas & Texas	786	786				2,338,217	2,612,570		274,353	10.5	2,974	3,324		350	10.5
Ohio & Mississippi	575	393	182		46.3	2,539,101	2,702,370		163,269	6.0	4,416	6,876		2,460	35.8
St. Louis, Alton & Terre Haute, Belleville Line	71	71				458,159	459,604		1,445	0.3	6,448	6,469		21	0.3
St. Louis, Iron Mt. & Southern	685	684	1		0.1	2,873,424	2,557,024	316,400		12.4	4,195	3,738	457		12.2
St. Louis, Kansas City & North'n	504	487	17		3.5	2,139,966	2,083,884	56,082		2.7	4,246	4,279		33	0.8
St. Louis & Southeastern	349	349				813,555	1,053,170		239,615	22.8	2,331	3,018		687	22.8
Totals	7,936	7,659	277			$40,943,416	$40,060,906	$2,809,116	$1,926,666		$5,159	$5,231		$72	1.4
Total increase			277		3.6			882,450		2.2					

the usual Bessemer "converters," in which the melted cast iron is decarbonized and then converted into steel by the addition of a definite quantity of "spiegel." The steel in the melted state is then cast into ingots. These are then reheated in a gas furnace and hammered under a steam hammer. They are then called blooms and are heated again and rolled into rails. The gas for the furnace is supplied from a Siemens gas producer, an intelligible description of which would be impossible without engravings. All the work, that is the handling of the material and its manipulation, is performed by hydraulic power. The ingenious machinery designed for this purpose could only be adequately described by a long article elaborately illustrated. It must suffice here to say that nearly all the lifting, turning, or moving of heavy objects is effected by hydraulic cranes or by the application of hydraulic power in some form. An engineer experienced in the construction of such works having promised us some account of them, an omission of one here will be the more readily excused.

In addition to the production of steel rails, and to a certain extent independent of it, this company is engaged in the manufacture of steel frogs, switches and crossings. The special switch which it makes is the one designed and patented by Mr. Lorenz, Engineer of the Philadelphia & Reading Railroad. A special department is devoted to this kind of work, and it has already assumed very large proportions, and promises to increase very rapidly.

The works are under the management of Major H. S. Bent, and the frog department under that of Mr. Caleb Jackson. The general offices and officers are in Philadelphia.

SOUTHWARD.

Matters which need not be referred to here caused a divergence from the course mapped out for the journey described here, and led the writer to York and Hanover and thence to Baltimore. At York the car works of Messrs. Billmeyer & Small and of Michael Schall were found to be almost entirely idle.

The old route to Hanover, which heretofore was southward to the Hanover Junction and thence *via* the Hanover Branch road, was found to be nearly obsolete; the new "Short Line," as it is called, which has been leased and is worked by the Pennsylvania Railroad Company, having absorbed nearly all the travel between the two places. The latter company is now running through trains from Columbia to York, Hanover and over the old Frederick & Pennsylvania Line Railroad, now called the Frederick Division of the Pennsylvania road, to Frederick, Md. The business of the Hanover Branch, or, as it is now called, the Hanover Junction, Hanover & Gettysburg road, has been very much injured by the new line, and doubtless it will never recover what it has lost.

AN ACCIDENT.

Travelers from Hanover to Baltimore usually take the old road from Hanover to the Junction, as it is shorter by some miles. From the Junction the Northern Central road follows the course of a stream which flows northward and empties into the Susquehanna, until a point called Summit is reached. It then strikes a stream which flows southward, and empties into the Chesapeake Bay. The line therefore rises from the Junction to Summit on a tolerably steep ascent, and descends thence southward. The speed of trains running in that direction is therefore comparatively slow from the Junction to Summit, and thence correspondingly fast on the descending grade. The train in which the writer was traveling had run in this way until a point about a mile north of a station called Freeland's had been reached, when an unusual dust was observed outside the car windows, which was at first attributed to a road crossing, but was soon followed by several sharp concussions, which at once put every one on the alert and in a state of intense suspense, while they waited to learn whether it would be tragedy or comedy. Two distinct crashes followed, and from the car window the fragments of a broken truck were visible, and then the speed slackened and in a few seconds the train stopped, and all on board again felt safe. When the passengers left the car it was found that a tender axle was broken, which had thrown the tender truck off the track, but it still occupied its proper position near and longitudinal to the rails, after having run about half a mile over the cross-ties. The trucks of the express and baggage cars were, however, all thrown entirely clear of the track the train was running on, and several of them were totally demolished. The most extraordinary feature was that the baggage car had been thrown entirely off the track occupied by the train and fell on its side on the adjoining track, and quite clear of the cars behind it, so that every one of them ran past without injury, and the two last cars did not leave the rails. What made the danger more imminent was that the accommodation train running northward was due a few minutes after the accident, and as the point of the road at which it occurred was followed by a curve immediately south of it, the place was not visible to the approaching train. Fortunately signalmen were promptly sent out to warn it, so that it was stopped in time to prevent any further injury.

The accident, it is believed, was caused by the breaking of the tender axle, which threw the tender truck off the track. The safety chains, however, held the tender truck in line with the rails, from the time it first went off the track until the engine stopped, without doing serious injury; but as soon as the car trucks left the track, their safety chains were broken, and the trucks was thrown crosswise of the track, so that they were crushed and broken and thus threw the baggage and express cars off. If the chains had been strong enough to hold the car trucks, the latter would probably have run as far as the tender truck did without damage. Of course when one truck is broken loose from its attachments to the car body, and especially if it gets crosswise of the track, it very soon obstructs the motion of those behind it, and the momentum of the car-bodies tears the latter loose from the frame until a general wreck ensues. If, however, as we have often pointed out, the check chains are strong enough to hold the trucks in line with the rails, the wheels will run a long distance without doing any serious injury.

BALTIMORE.

With the exception of a brief visit to the Northern Central Railroad shops, the writer had little or no opportunity to observe railroad affairs in Baltimore. The shops of this company are located at the northern part of the city and are now presided over by Mr. Godfrey Rhodes, who is Superintendent of Machinery of this road. He is a young man who received his training at Altoona and belongs to the class of educated men who have had a practical training, a class from which it is believed there will be more master mechanics selected hereafter than has been the case heretofore.

ALTOONA.

From Baltimore the writer went to Altoona, where, as is well known by most railroad men, the principal shops of the Pennsylvania Railroad are located. The first thing which attracts the attention of a stranger or a person who has not visited this place within a few years is the new erecting shop. This has been put up parallel to the old machine shop and between it and the tracks. It is 350 ft. 6 in. long and 66 ft. 6 in. wide, and has three tracks in it running lengthwise. The two side ones are used for repairing and erecting engines and have each room for seven engines. The side walls of the shop are constructed with brick arches over each window. These are made very strong and carry the tracks for two overhead traveling cranes. Each crane consists of two "fish-bellied" plate-iron girders, which span the shop from one of the walls to the other, with a transverse traveling carriage on each. Each girder weighs nine tons, and the distance between their end supports is 59 feet. The cranes have each a lifting capacity of 25 tons, so that by attaching one to each end of a locomotive it can be lifted up with the greatest ease and carried from one end of the shop to the other.

The cranes are driven by means of a cotton rope traveling at the rate of 5,074 ft. per minute, and the power is applied by pressing the running rope against appropriate grooved wheels in the shafts of which are screws which work into worm wheels and the usual reducing gearing. The cranes travel along the walls at the rate of 55 ft. per minute and the transverse traveling carriage at 29 to 30 ft. per minute. The crane has two hoisting speeds, the quickest moving at the rate of 8 ft. and the slowest 15 in. per minute.

Below the floor on each side of the center track are deep paved pits extending the entire length of the shop, in which there is room to stow the machinery of the engines which are undergoing repair, the boilers of which must often go to the boiler shop. When they are removed, the floor of the shop is not obstructed at all by any of the parts of the engines, all of which can be deposited in the pits, which are large enough to receive a pair of 5½ ft. wheels. The floor is made in sections 12 ft. 9 in. long by 12 ft. wide, with which the pits are covered. Each section has two iron gratings in it, to allow the warm air, heated by steam pipes below, to escape into the shop above. The gratings are also so constructed that a chain can be attached to them and the section then raised or lowered by the crane. Fresh cold air enters the pits through openings in their sides. It is thus heated by the steam and ascends through the gratings as described.

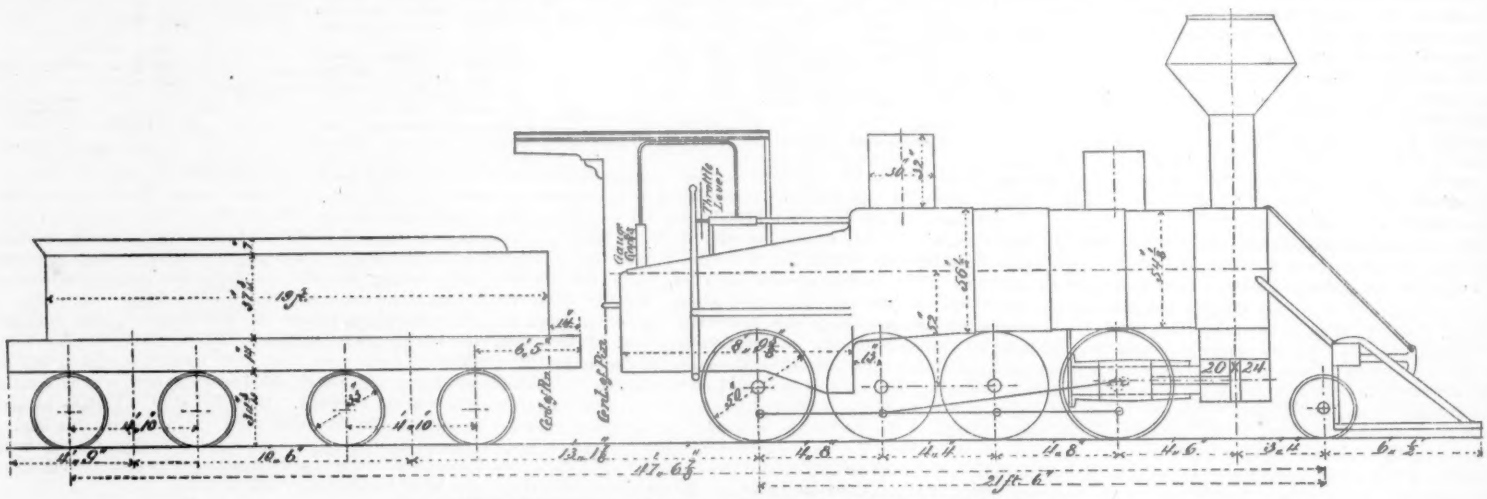
There is also a system of pipes in the pits which is connected to a force pump. These pipes are arranged so that they can be connected with any of the engines on the track above, and the boilers be subjected to a pressure of 200 lbs. hydrostatic pressure.* Steam for testing boilers is supplied by two extra strong boilers, which carry sufficient pressure to produce 125 lbs. in the boiler of the locomotive being repaired.

The pump which supplies the water for the hydrostatic test is a triple Worthington pump, with steam cylinders 10 in. in diameter, water suction cylinders 6 in. in diameter, and pressure forcing cylinders 3½ in. diameter, which are all in line and connected to each other and have a 10 in. stroke. In connection with the pressure cylinders is a pressure accumulator with a cylinder 18⅛ in. diameter. The lifted cylinder and weights on it weigh 33,318 lbs.

The suction cylinders of the pumps are used to pump out the drainage of the pits, which flows into a well provided for the purpose. This is necessary, because the bottom of the pits is lower than the system of the city sewerage.

At the back end of each pit are hose connections which can be connected with the blow-off cock of the locomotive boilers, and by means of triple valves they can be filled with either water or steam.

The room is lighted at night by means of six reflectors made by the American Reflector Company, each of which is 60 in. in diameter and has 20 gas burners. There is also a burner at each vise, and alongside the pit. Convenient to the engines are two hose connections from which portable hose lights may be used in the fire-boxes of the boilers.



CONSOLIDATION LOCOMOTIVE—PENNSYLVANIA RAILROAD.

For the information contained in this description of the new shop we are indebted to Mr. G. W. Strattan, Master Mechanic at Altoona.

The Pennsylvania Railroad Company has been engaged for some months past in preparations for the Centennial. During the past year it has built twenty-five new passenger engines, fifteen of which are for burning anthracite coal and ten for bituminous. Each kind of engine has 17 × 24 in. cylinders, with 5-feet wheels. At present the force in the shop is engaged on seventeen large freight engines of the Consolidation pattern, a skeleton drawing of which is reproduced in the engraving herewith. The dimensions of these engines are as follows: cylinders, 20 × 24 in.; driving wheels, 50 in. diameter; truck wheels, 28 in.; distance from center to center of cylinders, 84 in.; distance between frames, 43 in.; the steam ports are 17¾×1¼; exhaust ports, 2⅛ in., and the bridges between steam and exhaust ports 1 in. wide. The throw of eccentries is 5 in.; outside lap of valves, ¾ in.; diameter of piston-rod, 3¼ in.; diameter of driving axles, 6¼ in.; and length of journal, 7⅛ in. The size of boiler, wheel-base and other dimensions are given on the engraving of the engine. The thickness of the boiler plates next to the fire-box is 7-16 in. and the other plates are ⅜ in. thick. The fire-box is 8 ft. long × 34⅛ in. wide inside. The number of tubes is 198, which are 12 ft. 11 in. long × 2⅛ in. diameter outside. The engines have two outside pumps attached to the guide-yokes and worked from the cross-head. The feed-water is carried into the boiler and distributed there by a perforated cast-iron pipe over as large an area as possible. One small Sellers injector is used for feeding the boiler when standing still. The weight of engines is as follows:

	Pounds.
Weight on truck	12,240
" " front driving-wheels	21,880
" " second " "	19,200
" " main " "	19,540
" " back " "	19,080
Total weight of engine	91,640
Weight of tender with coal and water	53,410
Total weight of engine and tender	145,050

The capacity of the tank is 2,400 gallons.

The feature of the engines which is the most striking is the sloping fire-box, which is made almost exactly like that used on the old "Camel" engines built by Winans twenty years ago. The crown-sheets are stayed to the outside shell by ordinary stay-bolts. The object aimed at in adopting this form of construction was the same as that which led Mr. Winans

*The pressure at which the boilers are tested is 160 lbs. water pressure and 125 lbs. steam pressure.

to use it on his engines—that is, to use a long fire-box without increasing the weight behind too much. It will be seen from the distribution of weight on the wheels that the back wheels carry even less weight than any of the others, but that the distribution on all of them is very nearly equal. The advantage which this form of construction possesses over any other, in staying the crown-sheet, and its diminished weight, have often been pointed out, but thus far it has not gained in favor as much as its merits seem to deserve. If the different forms of locomotives were submitted to periodic competitive tests, the merits of such forms of construction would, it is believed, soon be made apparent, and come into use by sheer force of their inherent advantages. It is a subject well worth the consideration of railroad men whether it would not be wise to induce different master-mechanics to submit their engines to competition under the same conditions and on the same roads in order to determine which of them will do the best service.

The object in building these engines for the Pennsylvania road so large and powerful was to enable them to take the same trains over the more difficult portions of their road that their ordinary engines haul over the more level sections, thus making the trains continuous instead of dividing them as is now necessary.

Further description of the Altoona shops must be reserved until next week.

The Spring Garden Street Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your Philadelphia correspondence of Nov. 13 calls attention to a most glaring outrage upon good taste which has recently been perpetrated by the designers of the new Spring Garden Street Bridge.

Comments on the vile style of its ornamentation have been plentiful, and perhaps no one but the originator of the massive arches, and the tinker who soldered them, would have the temerity to defend such audacious "shoddyism; but your article is the first notice of the bridge I have seen in print, and I write to urge that, in the interest of all that is good and graceful in engineering, you should keep this matter before your readers until the "galvanized lies' are stripped from this otherwise noble structure. Your correspondent says the Keystone Bridge Company are not responsible for the bad points of the bridge. Will some one say who it is that carries this load? And then, perhaps, he will kindly explain the why and wherefore of this cheap trickery. QUAKER CITY.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

New Jersey Southern.—At the annual meeting in Long Branch, N. J., Nov. 17, the following directors were chosen: Nehemiah Perry, Newark, N. J.; Leon Abbett, Jersey City, N. J.; Robert Rennie, Lodi, N. J.; David P. Patterson, Hackensack, N. J.; E. C. Taylor, Elizabeth, N. J.; Hon. John P. Stockton, Trenton, N. J.; Abraham Browning, Camden, N. J.; Edwin Eldridge, H. W. Rathbone, Elmira, N. Y.; H. H. Cook, Le Roy, N. Y.; S. M. Mills, C. J. Osborne, New York City; C. W. Huntington, Boston. The only new director is H. W. Rathbone, who succeeds S. W. Bates.

Connecticut Western.—At the annual meeting in Hartford, Conn., Nov. 16, the following directors were chosen: George M. Bartholemew, George T. Hillyer, Nathaniel B. Stevens, Timothy M. Allen, Wm. Bolles, George S. Frink, Hartford, Conn.; Byron Loomis, Suffield, Conn.; George Dudley, Wm. L. Gilbert, Winsted, Conn.; Joseph Toy, Simsbury, Conn.; Frederick Watson, Canaan, Conn.; Wm. H. Barnum, Alexander H. Holley, Salisbury, Conn. The only new director is Mr. Frink, who replaces C. Blair.

Gilman, Clinton & Springfield.—Mr. T. J. Nicholl, formerly of the Plymouth, Kankakee & Pacific and other roads, has been appointed Chief Engineer.

Cleveland, Columbus, Cincinnati & Indianapolis Mutual Life Insurance Association.—At the annual meeting in Delaware, O., Nov. 17, the following officers were chosen: President, Robert Blee, Cleveland, O.; First Vice-President, C. C. Gale, Indianapolis; Second Vice-President, C. Potter, Delaware, O.; General Secretary, Wm. L. Needham, Cleveland, O.; Treasurer, S. B. Jackson, Cleveland, O.; Auditor, George W. Burt, Galion, O.; Executive Committee, H. M. Townsend, I. Moore, William Cleave, Cleveland, O.; John Brunton, Bellefontaine, O.; B. F. Krohn, A. B. Quigley, Galion, O.; W. G. Knight, Delaware, O.; V. P. Latimer, Springfield, O.; John Lane, Indianapolis.

Mississippi & Tennessee.—At the annual meeting in Memphis, Tenn., Nov. 17, the old board was re-elected, and at a subsequent meeting it re-elected the old officers, as follows: President, H. G. McComb; Vice-President, F. M. White; Secretary and Treasurer, S. H. Lamb. The road is worked by the New Orleans, St. Louis & Chicago.

Stanstead, Shefford & Chambly.—At the annual meeting in Waterloo, P. Q., Nov. 10, the following directors were chosen: Charles Allen, J. G. Cowie, L. T. Drummond, H. S. Foster, R. Merry, Guy C. Noble, H. L. Robinson, G. G. Stevens, John Williams. The board re-elected L. T. Drummond President; Charles Allen, Vice-President; John P. Noyes, Secretary.

Boston & Providence.—At the annual meeting in Boston, Nov. 17, the old board was re-elected, as follows: Joseph W. Balch, J. H. Clifford, T. P. I. Goddard, G. W. Hallett, W. R. Robeson, F. M. Weld, H. A. Whitney.

Naugatuck.—At the annual meeting in Bridgeport, Conn., Nov. 17, the following directors were chosen: E. F. Bishop, W. D. Bishop, R. Tomlinson, Bridgeport, Conn.; R. M. Bassett, Derby, Conn.; F. J. Kingsbury, Waterbury, Conn.; J. G. Wetmore, Winsted, Conn.; H. Bronson, J. B. Robertson, New Haven, Conn.; A. L. Dennis, Newark, N. J. The board re-elected the old officers, as follows: President, E. F. Bishop, Bridgeport, Conn.; Secretary and Treasurer, Horace Nichols, Bridgeport, Conn.; Superintendent, George W. Beach, Waterbury, Conn.

Lake Erie, Evansville & Southwestern.—Mr. W. Hart Smith, of New York, has been chosen Secretary, in place of W. P. Ward.

Brazil, Worthington & Bloomfield.—This company was recently organized by the election of the following directors: S. B. Harrah, Willis Hatson, P. McKissick, James E. Miller, C. N. Shaw, Godfrey Shryer, W. P. Squire, M. C. Taylor, S. P. Williams. The board organized by electing Putnam McKissick, President; Godfrey Shryer, Vice-President; S. H. Carnahan, Secretary; Wm. C. Smyth, Treasurer.

Rockford, Rock Island & St. Louis.—Mr. George Skinner has been appointed General Manager and assumed the duties of the position Nov. 1. Mr. Skinner was recently General Superintendent of the Louisville, Cincinnati & Lexington, and has had charge of several Eastern roads. He brings with him 30 years' experience in railroad matters to his new position, and will endeavor to make his present charge one of the best managed roads in the country.

American Electrical Society.—At the annual meeting in Chicago last week the following officers were chosen: President, Gen. Anson Stager, Chicago; Vice-Presidents, C. H. Haskins, Milwaukee, Wis.; George B. Prescott, New York; Harvey P. Dwight, Toronto, Ont.; John Van Horne, New York; I. N. Miller, Chillicothe, O.; E. P. Wright, Cleveland, O.; J. J. Dickey, Omaha, Neb.; Corresponding Secretary and Librarian, F. W. Jones, Chicago; Recording Secretary, C. S. Jones, Chicago; Treasurer, E. B. Chandler, Chicago; Executive Committee, C. S. Summers, J. J. S. Wilson, Wm. H. Smith, G. H. Bliss, F. H. Tubbs, all of Chicago; directors, W. W. Smith, Indianapolis; S. D. Field, San Francisco; George T. Williams, M. C. Bristol, Cincinnati; C. O. Rowe, Pittsburgh; R. C. Clowry, St. Louis; N. Hucker, J. W. Tillinghast, Buffalo; Hugh Neilson, Toronto, Ont.; O. H. Booth, Mansfield, O.; W. C. Long, Dr. E. A. Hill, Chicago; A. Hayward, Vincennes, Ind.; C. W. Ross, Columbus, O.; E. Sholes, Dubuque, Ia.

Indianapolis, Decatur & Springfield.—This company, formed by the consolidation of the organizations made in Indiana and Illinois by the bondholders who bought the old Indiana & Illinois Central road at foreclosure sale, has been organized by the election of the following directors: J. R. Elder, J. E. McDonald, E. J. Peck, Indianapolis; Joseph B. Fordice, Putnam County, Ind.; E. M. Benson, Montezuma, Ind.; John Bunn, E. F. Leonard, Springfield, Ill.; George M. Pullman, Chicago; J. D. Platt, Dayton, O.; George Walker, Springfield, Mass.; Benjamin E. Bates, Boston; Charles Dana, Sidney Dillon, H. C. Fahnestock, Wm. H. Guion, Henry B. Hammond, Chauncey Vibbard, New York. This board organized by electing Henry B. Hammond President; Chauncey Vibbard, Vice-President; H. C. Fahnestock, Treasurer; A. Duprat, Secretary. The President's office is at No. 120 Broadway, New York.

Hannibal & St. Joseph.—At a meeting of the board in New York, Nov. 18, Wm. H. Neilson, Allan Campbell and Joseph Richardson were chosen directors to fill vacancies made by resignation. The board is now composed of the following gentlemen: J. P. Acker, H. H. Baxter, Allan Campbell, B. F. Carver, Charles E. Loew, D. L. McCready, Wm. H. Neilson, Joseph Richardson, J. Van Schaick. The board elected Wm. H. Neilson President and General Manager; J. P. Acker, Treasurer; R. S. Stevens, General Superintendent.

Mr. W. W. Fagan has been appointed Division Superintendent and will have charge of the Kansas City & Cameron Division, with office at Kansas City, Mo. Mr. C. A. Chase will retain the position of General Agent at Kansas City. Mr. Fagan was Assistant Superintendent of the Atchison, Topeka & Santa Fe from Oct. 1, 1869, to Feb. 1, 1874, and General Superintendent of the Kansas Midland from March, 1874, to Sept. 30, 1875.

Old Colony.—At the annual meeting in Boston, Nov. 23, the following directors were chosen: Benjamin Finch, Newport, R. I.; Thomas J. Borden, John S. Brayton, Fall River, Mass.; Prince S. Crowell, Dennis, Mass.; Ephraim N. Winslow, Hyannis, Mass.; Jacob H. Lond, Plymouth, Mass.; Royal W. Turner, Randolph, Mass.; Charles F. Choate, Cambridge, Mass.; Oliver Ames, Easton, Mass.; Samuel J. Crocker, Uriel Crocker, Francis B. Hayes, Onslow Stearns, Boston. There is no change from last year.

Indianapolis & St. Louis.—This line and the Vandalia Line between Indianapolis and St. Louis are hereafter to be worked under one management. Maj. John E. Simpson, General Superintendent of the Vandalia, has been appointed General Manager of the united lines, and Samuel Woodward, of the Indianapolis & St. Louis, General Superintendent. Mr. Simpson's office will be in St. Louis and Mr. Woodward's in Indianapolis.

PERSONAL.

—Mr. Samuel Farwell, of Utica, N. Y., who died last week in East Saginaw, Mich., was 80 years of age and had been a contractor for 55 years. A mason by trade, he took in 1820 some considerable contracts on the Erie Canal and was employed for six years on that work. Subsequently with his partners he had large contracts on the Delaware & Hudson, the Lehigh Canal in Pennsylvania, the Chemung, Chenango and Crooked Lake canals in New York, and the Delaware & Raritan Canal in New Jersey. He also had contracts on several of the lines now forming the New York Central, on the extension of the Harlem road to Chatham Four Corners, and for some 70 miles of the Erie through Orange and Sullivan counties, and on the western end of the line. In 1850 he took 105 miles of the Great Western of Canada and in 1854 a large part of the Utica & Black River road. Besides his railroad work he built part of the Croton Aqueduct and a reservoir in Boston and had an interest in a steamboat line on the St. Lawrence. He became connected with the Flint & Pere Marquette Company in 1854, and at the time of his death was Vice-President and a large stockholder. Dr. H. C. Potter, General Manager of that road, is his son-in-law, and he was on a visit to him at the time of his death. He had accumulated a considerable property, and was a prominent member of the Masonic fraternity.

—Mr. Charles A. Tinker, Superintendent of Telegraph and General Train Dispatcher of the Central Vermont lines, has sent in his resignation, to take effect Dec. 1.

—Mr. W. R. Morrison has resigned his position as Assistant Treasurer and Cashier of the Chicago & Michigan Lake Shore Company, and will engage in the insurance business at Grand Rapids, Mich.

—Hon. Richard Franchot, formerly for some years President of the Albany & Susquehanna Railroad Company, died in Schenectady, N. Y., Nov. 23, aged 58 years. He was in early life a civil engineer, but subsequently became a farmer.

TRAFFIC AND EARNINGS.

Chicago Live Stock.

For the two weeks ending with Nov. 20 receipts were:

	1875.	1874.	Inc. or Dec.	P. c.
Hogs	255,234	369,938	Dec..114,704	31.0
Cattle	31,257	30,228	Inc.. 1,029	3.4

Freight Rates.

The Winter tariff from Chicago to points on the Upper Mississippi went into effect Nov. 22. The new rates per 100 pounds are as follows:

Chicago, to	1st class.	2d class.	3d class.	4th class.	Grain.	Oil per bbl.
Dubuque	$0.60	$0.50	$0.40	$0.30	$0.20	$0.80
St. Paul, or Minneapolis.	1.00	0.85	0.70	0.50	0.25	.....

The oil rate is per car load of 50 barrels.

The rate from New York to Cincinnati has been changed somewhat, and is now as follows: First class, 70 cents per 100 pounds; second class, 64 cents; third class, 55 cents; fourth class, 39 cents; special class, 32 cents.

A meeting of managers and freight agents was held in Chicago, Nov. 17, but was for the most part occupied in arranging classifications. It is said that the meeting decided to postpone the question of a further increase in rates until after Dec. 1; if an increase is then made it will be on the basis of 45 cents for fourth-class from Chicago to New York.

A meeting of managers was to be held in New York this week to consider the question of a further increase in rates on west-bound freight.

Railroad Earnings.

The following figures are from reports made to the Massachusetts Railroad Commission for the year ending Sept. 30, 1875:

	Earnings.	Expenses.	Net earn.	Earn. per mile.	P. c. of exp.
Boston & Lowell	$1,207,578	$1,000,043	$207,535	$15,095	82.81
Boston & Providence	1,581,258	1,134,022	447,236	23,778	71.72
New Haven & Northampton	595,164	392,250	202,914	5,460	65.91
Norwich & Worcester	729,440	434,442	294,998	10,986	59.54
Worcester & Nashua	514,410	336,079	178,331	11,183	65.30

Other earnings have been reported as follows:

Year ending Sept. 30:

	1874-75.	1873-74.	Inc. or Dec.	P. c.
Naugatuck	$501,396	$491,767	Inc .. $9,629	2.0
Expenses and taxes	279,068	297,482	Dec.. 18,414	6.2
Net earnings	$222,328	$194,285	Inc .. $28,043	14.9
Earnings per mile	8,153	7,996	Inc .. 157	2.0
Per cent. of expenses	55.64	60.49	Dec.. 4.85	8.0
Connecticut Western	$385,796	$350,786	Inc .. $35,010	10.0
Expenses	201,500	212,235	Dec.. 10,735	5.1
Net earnings	$184,296	$138,551	Inc .. $45,745	33.0
Earnings per mile	5,673	5,159	Inc .. 514	10.0
Per cent. of expenses	52.23	60.50	Dec.. 8.27	13.7

Month of October:

	1875.	1874.		
Cairo & St. Louis	$28,715	.....	.....	....
Peoria & Rock Island	36,329	.....	.....	....
Expenses	20,540	.....	.....	....
Net earnings	$15,789	$4,924	Inc .. $10,865	220.6
Per cent. of expenses	56.54	.....	.....	....

First week in November:

Cairo & St. Louis	$7,677	.....	.....	....
Denver & Rio Grande	7,069	$7,235	Dec.. $166	2.3
Michigan Central	148,322	132,859	Inc .. 15,463	11.6
Missouri, Kansas & Tex.	72,576	68,643	Inc .. 3,933	5.7
St. Louis, Iron M. & So.	122,220	84,991	Inc .. 37,229	43.8

Three months ending Oct. 31:

	1875.	1874.		
New Jersey & New York	$45,691	$36,763	Inc .. $8,928	24.3

Third week in November:

Chicago, Milwaukee & St. Paul	$212,000	$164,000	Inc .. $48,000	29.3

Railroad Traffic.

The Union Railroad in Baltimore carried the following traffic in the five months from June 1 to Oct. 30:

	1875.	1874.	Increase.	P. c.
Passengers	84,390	63,824	20,566	32.1
Cars of freight	7,212	4,544	2,668	58.6

The freight traffic of the Utah Central and Utah Southern roads for October, was as follows:

	Tons.
Utah Central	11,670
Utah Southern	7,299
Total	18,969

The principal item of freight on the Central was 4,319 tons of coal and coke; on the Southern it was 3,051 tons of ore and bullion.

During the month of October the Central Pacific carried 7,348 through passengers westward and 3,164 eastward, a total of 10,512.

Flour and Grain Movement.

Receipts and shipments for the week ending Nov. 13 are reported as follows (flour in barrels and grain in bushels):

Flour:	1875.	1874.	Increase.	P. c.
Lake ports' receipts	151,398	129,764	21,634	16.7
" " shipments	170,395	129,411	40,984	31.5
Atlantic ports' receipts	297,775	281,285	16,490	5.9
Wheat:				
Lake ports' receipts	2,151,579	1,485,764	665,815	44.8
" " shipments	2,045,965	1,124,137	921,828	81.9
Atlantic ports' receipts	1,671,741	809,603	862,138	106.5
Grain of all Kinds:				
Lake ports' receipts	3,878,681	2,826,443	1,052,238	37.1
" " shipments	3,870,264	2,528,368	1,341,896	53.1
Atlantic ports' receipts	3,171,155	1,795,450	1,375,705	76.4

Of the grain shipments from lake ports 35 per cent. went by rail this year, against 31⅓ per cent. in 1874, and 21¼ in 1873.

For the two weeks ending with Nov. 20 Chicago receipts and shipments of grain were:

	1875.	1874.	Increase.	P. c.
Receipts	3,266,264	1,549,315	1,716,949	110.8
Shipments	3,233,207	1,824,824	1,408,383	77.2

Milwaukee wheat receipts from Nov. 1 to Nov. 20 were:

	1875.	1874.	Increase.	P. c.
Receipts	9,516,000	6,210,000	3,306,000	53.2

Coal Movement.

Coal tonnages are reported as follows for the week ending Nov. 13:

	1875.	1874.	Inc. or Dec.	P. c.
Anthracite	573,863	490,794	Inc .. 87,069	....
Semi-bituminous, Broad Top and Clearfield	26,528	.....	.....	....
Cumberland	50,376	.....	.....	....
Bituminous, Barclay	7,831	.....	.....	....
" Western Pa.	32,660	.....	.....	....
" West Va.	4,311	.....	.....	....

The West Virginia returns (Chesapeake & Ohio Railroad) are a week behind the rest.

The coal tonnage of the Pennsylvania Railroad for the first week in November was:

	Tons
Anthracite	19,579
Bituminous	61,647
Coke	14,729
Total	95,955

THE SCRAP HEAP.

Railroad Manufactures.

The Passaic Rolling Mill at Paterson, N. J., started up Monday after a suspension of two weeks. About 375 men are employed, and there are orders on hand enough to last for some time. The mill turns out principally rolled beams and shape iron.

The Wason Car Company, at Springfield, Mass., has now orders for 44 passenger cars on hand, and expects to keep from 500 to 800 men at work through the winter.

The Marquette & Pacific Furnace, at Marquette, Mich., is running 1,050 tons of Bessemer pig per month.

The Bellevue Iron & Steel Company has been organized to work the Hansford iron property, near St. Albans, W. Va. The company purposes mining iron ore and coal and making pig iron, bar, hoop, sheet iron and iron and steel rails. The capital stock is $100,000, with privilege of increase to $500,000.

The office will be at Spring Hill, Kanawha County, West Virginia.

The firm of Lewis, Bailey, Dalzell & Co., of Pittsburgh, has been dissolved by mutual consent. A. McD. Bailey and J. E. B. Dalzell retiring. The business will be continued by the remaining members, J. C. Lewis, Robert Dalzell and Lewis W. Lewis, under the style of Lewis, Dalzell & Co.

The old Lancaster Locomotive Works at Lancaster, Pa., were sold at sheriff's sale recently and were bought in by the American Life Insurance Company of Philadelphia, which holds a mortgage of $75,000 on the property.

It is said that the Marietta (O.) Iron Works have a contract for the rails and frogs for 60 miles of road in Kansas.

The Philadelphia & Reading Railroad Company's rolling mill at Reading, Pa., is now running full-handed and on full time for the first time during 18 months. The whole force will be thus employed until the holiday season, when the works will be closed two weeks for the usual annual repairs.

The Indianapolis Rolling Mill is re-rolling a lot of iron for the Indianapolis, Peru & Chicago, and has just closed a contract to re-roll another lot for the Fort Wayne, Muncie & Cincinnati.

Messrs. Riehle Brothers have removed their Philadelphia Scale and Testing Machine Works to the new and commodious buildings which they have erected on Ninth street, above Master, Philadelphia. The new buildings are larger and more convenient than the old, and have every facility for work.

The Pittsburgh Locomotive & Car Works have taken the contract for doing the iron work for the Point Bridge over the Monongahela at Pittsburgh. The American Bridge Company has the general contract for the bridge, which is to be a stiffened suspension bridge of 800 feet span. The Locomotive Works expect to employ about 150 men for five or six months on this bridge work.

The Charcoal Forge of Moret & Knauer, at Knauertown, Chester County, Pa., will be removed to Douglasville, Pa., on the Reading road, where new and larger buildings are being erected.

The National Locomotive Works.

The firm of Dawson & Baily, owners of the National Locomotive Works, at Connellsville, Pa., has been dissolved by the withdrawal of Mr. George F. Dawson. Mr. William H. Baily will collect and settle the accounts of the old firm. The business of manufacturing locomotives will be continued at the same place by W. H. Baily & Co., light and narrow-gauge locomotives being made a specialty, as heretofore.

OLD AND NEW ROADS.

St. Louis & Southeastern.

The Auditor reports for October the earnings as follows: St. Louis Division, $63,839.17; Kentucky Division, $28,568.95; Tennessee Division, $12,447.76; total, $104,855.88; total, 1874, $131,865.03; showing a decrease of $27,009.15, or 20.5 per cent., this year.

Peoria & Rock Island.

The Receiver reports the actual earnings and expenses of the road for October as follows:

From freight	$25,125 89
Passengers	8,587 00
Mail and express	695 42
Miscellaneous	1,920 49
Total earnings ($399.22 per mile)	$36,328 80
Working expenses (56.54 per cent.)	20,540 29
Net earnings ($173.50 per mile)	$15,788 51

The net earnings show an increase of $10,864.85, or 220.6 per cent., over the month of October, 1874.

Atlanta & Richmond Air Line.

The road is now being run in two separate divisions, Mr. Fisher, the Receiver appointed by the United States Circuit Court, having possession of the road to the Georgia line, and Colonel Buford running, as Receiver, the section from the Georgia line to Charlotte, N. C. Trains, however, are run through as usual, without transfer, the two receivers having, after some trouble, come to an agreement as to the operation of the road.

Toledo, Peoria & Warsaw.

A meeting of the first-mortgage bondholders was held in New York, Nov. 23. After some discussion the meeting voted to reject the plan of reorganization heretofore proposed, which recognized the junior mortgages and stock, on the ground that the holders of those securities had not shown a disposition to co-operate. It was resolved to proceed immediately with the foreclosure of the first mortgages and to reorganize in that interest entirely. Messrs. Isaac Sherman, R. C. Martin and Charles Moran were appointed a committee to prepare a new plan of reorganization, and Messrs. R. C. Martin, H. G. Barnes and H. De Coppet a committee to conduct the foreclosure proceedings. The first mortgages amount to $4,400,000, of which $2,800,000 are on the Western and $1,600,000 on the Eastern Division. There is also a first mortgage for $250,000 on the Burlington Branch.

Hudson Tunnel Railroad.

The suit of this company for condemnation of certain lands belonging to the Delaware, Lackawanna & Western Company has been argued this week before the Court of Errors and Appeals of New Jersey, on appeal from the Supreme Court. Two principal points are involved, one whether the company could legally organize under the general railroad law, that is, whether it was such a company as was contemplated by that law. The other, a somewhat intricate one, is whether the property in question, which is held under a State deed and warrantee, can be legally condemned. It was bought from the State as land under water, and the Riparian Commissioners, representing the State, gave the usual warrantee, and the question now is whether that warrantee can be set aside in favor of a company organized under a subsequent law of the State.

Toledo, Wabash & Western.

Negotiations are in progress between this company and the Indianapolis, Bloomington & Western for a pooling arrangement on business going to or from Peoria.

A largely attended meeting of stockholders was held in New York, Nov. 17. The committee appointed at the previous meeting reported the action taken at the annual meeting. They also reported that several conferences had been held with the committee of consolidated bondholders, who have begun foreclosure proceedings, and several plans of adjustment had been proposed. The committee had offered to recommend an assessment of as high as $10 per share, provided new stock or income bonds could be issued for the amount. The bondholders were unwilling to concede this and urged a contribution of $20 per share and the surrender of one-half the stock. The bondholders also believed a foreclosure and sale necessary in order to relieve the road of numerous leases and contracts; they also proposed to ask, in their plan of reorganization, for the funding of several coupons on the prior mortgages (about $17,000,000), and claimed that whatever they allowed the stockholders would not be of right, but a sort of gift, which should be liberally paid for.

The meeting resolved to appoint a protective committee to take measures to preserve the rights of the stockholders in the property; to pay an assessment of 50 cents per share to meet necessary legal expenses, and to authorize the committee to entertain any fair and reasonable proposition that may be made by bondholders. Messrs. O. D. Ashley, H. G. Henry and I. B. Newcomb were appointed as the protective committee.

The Protective Committee has opened an office at No. 2 Exchange court, New York. The Committee is now ready to receive the assessment of 50 cents per share voted by the meeting.

Little Rock, Pine Bluff & New Orleans.

This road and the Mississippi, Ouachita & Red River road are to be sold in Little Rock, Ark., Dec. 16, under foreclosure of mortgage. The two roads were consolidated some time ago under the name of Texas, Mississippi & Northwestern, but the foreclosure is made under the original and separate mortgages. A meeting of bondholders was to be held in Boston, where the bonds are mainly owned, this week.

Pacific, of Missouri.

The suit for foreclosure of the third mortgage and the appointment of a receiver has been adjourned from time to time and will probably not be heard for some days yet, as the United States Circuit Court in St. Louis, where the suit is brought, has been and is still occupied with other and pressing business.

The unsecured creditors claim to have obtained the assent of a majority of the creditors to the petition in bankruptcy, but will not press their suit for the present, until they see what the result of the other suits is likely to be.

Col. J. L. Stephens and associates, who bought the Boonville Branch at foreclosure sale some time since, have begun suit in the Moniteau County (Mo.) Circuit Court to recover nearly $150,000, claimed to be due for rental of their line and interest. An offset is claimed by the lessees for taxes and other charges paid.

The Illinois Railroad Law.

The Attorney General has advised the Railroad Commissioners to withdraw the suits brought against the Chicago & Northwestern for violation of the law. Under the decision of the Supreme Court in the Chicago, Burlington & Quincy case, the suits cannot be maintained in their present form.

The American Electrical Society.

The annual meeting was held in Chicago, Nov. 17, a large number of members being present. A number of names were presented for membership and accepted. A number of scientific papers that had been read at the monthly meetings were read by title, and ordered printed in book form, with cuts and diagrams representing the various subjects treated therein.

Dr. Hill read a communication from William Sooy Smith, Chairman of the Committee on Physical Phenomena of the United States Testing Board, to test iron, steel, etc., on physical phenomena, asking this society to suggest means by which they could determine at what time the molecular disturbance which takes place in a bar of iron or steel, when under a tensile or compressive strain constantly increasing, develops heat and electricity. This society appointed a committee to meet with the United States Testing Board, consisting of Messrs. C. H. Summers and Dr. Hill, of Chicago; Mr. Henning, of Buffalo; General Stager and Charles Haskins.

The constitution was revised, the holding of monthly meetings was abolished, and the society will meet annually at such place as the Executive Committee may determine. Auxiliary societies will be formed in the various cities throughout the country, such as St. Louis, Cincinnati, Philadelphia, Pittsburgh, etc. Papers coming before these auxiliary societies will be referred to the annual meeting of this society.

It was resolved to hold the next annual meeting in Chicago. After electing officers, passing resolutions expressing sorrow for the death of Prof. I. N. Lapham, and the usual resolutions of thanks, the society adjourned.

St. Paul & Pacific.

On the 5th of November the necessary number (one-half) of the certificates for the bonds were delivered to the Amsterdam arrangement committee, insuring the adoption of the agreement made with the company. The announcement of this fact caused a rise from 16 to 17 in the price of the Second Section ($3,000,000) loan, and from 11 to 11⅛ in the 1869 loan. But on the 6th the 1869 loan fell again, and closed at 11⅛.

Pennsylvania.

The wooden bridge over the Schuylkill at Market street, Philadelphia, was destroyed by fire on the evening of Nov. 20. The fire originated from the escape of gas from a leaky pipe. It was a street bridge owned by the city, but the tracks connecting the Pennsylvania depot in West Philadelphia with the freight depot in the city were laid across it, and its destruction causes a serious delay in the delivery of freight. The railroad company will build a temporary trestle bridge at once, without waiting for the action of the city authorities on rebuilding.

The old bridge was a wooden arch bridge of several spans, resting on stone piers. It was built in 1798 at a cost of $275,000, and in 1850, when the railroad tracks were laid over it, it was rebuilt at an expense of $500,000. It was 550 feet long, the approaches together being 759 feet long.

Cleveland, Columbus, Cincinnati & Indianapolis Railroad Mutual Life Insurance Association.

The annual meeting of this Association was held in Delaware, O., Nov. 17, delegates from 43 subordinate associations being present. Mr. Robert Blee, President, made an address, showing that the society was in a prosperous condition and pointing out its advantages.

The Secretary reported that at the beginning the year there were 1,491 members; 117 had been admitted, 9 readmitted and 10 reinstated. During the year 9 had died and 116 forfeited, leaving 1,502 members at its close. The general receipts for the year had been $529: expenses, including Secretary's salary of $300, $448.55. During the year 11 assessments, amounting in all to $15,997, had been collected and all paid over but one, which was held subject to order of Court, there being a dispute as to who was the legal heir of deceased.

Some discussion was had as to transfer of policies. An assessment of 25 cents per member for general expenses was ordered. The next annual meeting was appointed for the second Wednesday in December, at Cleveland.

The Texas & Pacific Conventions.

The first convention to advocate Government aid for the completion of this road was held in Memphis, Tenn., Oct. 19, and lasted two days. Delegates were present from Alabama, Louisiana, Mississippi, Arkansas, Tennessee, Kentucky, Ohio, Missouri and South Carolina. Hon. Beriah Magoffin, of Kentucky, was chosen Chairman, with Vice-Presidents from each State. A number of speeches were made and resolutions passed, setting forth that the Government furnished the money for building the existing lines to the Pacific coast, which, while beneficial to the entire Union, are peculiarly beneficial to the Northern States, and claim that the Southern people, with their limited means, are entitled to equal consideration at the hands of Government.

A resolution adding St. Louis to the list of proposed terminal points of the road was rejected, with the proviso that its name was not omitted in any spirit of opposition or hostility to that city.

The St. Louis Convention met Nov. 23, delegates from 20 States and Territories being present. Judge Stanley Matthews, of Cincinnati, was chosen President; Gen. Wm. Preston, of Kentucky, Vice-President; Col. John M. Howell, of Arkansas, Secretary. Speeches were made and a committee on business and resolutions appointed.

Western Counties.

The contract for the completion of this road, from Yarmouth, N. S., to Annapolis, has been closed, and the contractors, Messrs. Shanley & Plunkett, have taken possession, and will begin work at once. They have already advertised for bids for 130,000 ties. Mr. Plunkett will have immediate charge of the work, and will make his headquarters in Digby, Nova Scotia.

Chicago, Rock Island & Pacific.

It is reported that the Southwestern Branch will be extended in the Spring from Leavenworth, Kan., to Lawrence on a line west of the Leavenworth Branch of the Kansas Pacific.

Rome, Watertown & Ogdensburg.

The track of the Lake Ontario Division is now laid to a point 34 miles west of Charlotte, N. Y., and 11 miles beyond Kendall Corners, the last point noted. There are now 104 miles of track on the division.

Baltimore & Ohio.

Instructions have been issued to the Superintendent of the Telegraph Department to stop at once all the work of reconstruction on the telegraph lines. Agreeably to these instructions the construction camp of Line Superintendent Thomas Canon has been broken up, and all material ordered to be stored at headquarters and the men discharged, except one repair-man on each division.

An agreement has been made with the Canada Steamship Company, of Montreal, to run four of their steamers between Baltimore and Liverpool. The new line is known as the Beaver Line and is composed of four steamers, viz.: Lake Nepigon, Lake Champlain, Lake Megantic, and a fourth steamer nearly completed. Each ship is 2,300 tons capacity, and they will ply between Baltimore and Liverpool every two weeks.

Eastern.

Several small notes of the company went to protest in Boston, Nov. 17, the Treasurer stating that he had no funds to pay with. The stock declined in consequence from 22 to 15½.

The annual report has not yet been filed with the Railroad Commissioners, although the time fixed by law has expired and the company is liable to a fine for each day's delay.

Dividends.

Dividends have been declared by the following companies:

American Express, $3 per share, semi-annual, payable Jan. 3.

Meetings.

The annual meeting of the New York & New England Railroad Company will be held at the office, No. 224 Federal street, Boston, Dec. 7, at 11 a. m.

Auction Sales of Railroad Securities.

In New York, Nov. 24, at auction, $1,011,000 New York, Housatonic & Northern first-mortgage bonds, hypothecated, sold for $600; South Side of Long Island first-mortgage bonds brought 60½; Jackson, Lansing & Saginaw first-mortgage, guaranteed by Michigan Central, 99; Chicago, Danville & Vincennes, first mortgage, Indiana Division, 25¼; convertible bonds, 10.

Indianapolis, Decatur & Springfield.

The purchasers at judicial sale of the railroad, property and franchises of the Indiana & Illinois Central Railway Company, having obtained title thereto by deeds executed and delivered under and in pursuance of the order and decree of Court, vested the title of the same in the Springfield, Decatur & Indianapolis Railway Company and the Indianapolis, Decatur & Springfield Railway Company, which two companies have become consolidated into one organization, known as the Indianapolis, Decatur & Springfield Railway Company.

This company took possession Nov. 16 of the railroad, franchises and other property which it has acquired, and it was ordered that, until further notice, the officers, agents and employes now in the employ of Messrs. Fahnestock, Hammond, Nichols, Walker, Sands, Ashhurst and Platt, as a Committee of the first-mortgage bondholders of the Indiana & Illinois Central Railway Company, continue in their present positions as the employes of this company. The President, Mr. H. B. Hammond, has his office at No. 120 Broadway, New York.

Brazil, Worthington & Bloomfield.

This newly-organized company has filed its certificate with the Secretary of State of Indiana. The capital stock is fixed at $1,000,000, and the road is to run from Brazil, in Clay County, Ind., south by east to Bloomfield, in Greene County, about 45 miles. It is to be of three-feet gauge.

Worcester & Somerset.

This road has recently passed into the hands of Mr. William Painter, of Philadelphia, who talks of extending it from the present terminus at Newtown, Md., southeast to Bloodgood's Wharf, near the lower end of Chincoteague Bay. A survey has been made, and the people along the line are being asked for subscriptions.

Cincinnati, Wabash & Michigan.

Work on the extension southward is progressing steadily, the company's purpose being to complete it to Anderson, Ind., before spring.

Cleveland, Tuscarawas Valley & Wheeling.

The line for the proposed extension from Uhrichsville, O., to Wheeling, W. Va., has been located from Bridgeport, O., opposite Wheeling, up the Wheeling Creek to the mouth of Crab Apple Fork. From that point to Uhrichsville several lines have been run, and the final location will depend upon the amount of subscriptions offered on each line. The company offers to begin work if subscriptions to the amount of $500,000 can be secured and the right of way given.

Atlantic, Mississippi & Ohio.

On the other hand, a telegram states that the London agent of this company has notified the English bondholders that the company will not be able to meet even one-half of the interest due Oct. 1. The cause assigned for the failure is the general depression of business. General Mahone, the President of the road, is now in London, endeavoring to have the stockholders agree to the funding of the interest now due.

Hannibal & St. Joseph.

There has been another change in the management, Messrs. Allan Campbell, Wm. H. Neilson and Joseph Richardson, all of New York, having been chosen directors in place of James Craig, John B. Drake and N. D. Clapp, resigned. These gentlemen, with Messrs. Baxter and McCreedy, who were chosen at the last annual meeting, make a majority of the board new directors. Mr. Neilson becomes President and General Manager, while Mr. R. S. Stevens, late of the Missouri, Kansas & Texas, but recently made General Manager of this road, continues in charge of the road as General Superintendent. It is understood that there have been many changes recently in the ownership of the stock, which has not been very stable for some years past, and it is said that the present directors and officers hold a controlling interest.

Concerning the future policy of the company a correspondent of the Chicago *Railway Review* writes: "As respects the future, it is to be hoped that the company will indorse the liberal and sagacious programme which the General Manager will doubtless recommend: The company has some eight millions of bonded debt; the assets of the lands of the company

may be reckoned at four millions; of this three millions should be applied to the reduction of the bonded debt, reducing the funded indebtedness to five millions, at 6 per cent., drawing $300,000 annual interest. This would leave one million dollars, of which a quarter million should be applied to relieve the land grant from the existing lien. The remaining three-quarters of a million should be expended on permanent improvements. Half a million should be put into steel rails, giving the road 200 miles of steel track; and the remainder is needed for local and terminal improvements—the renewal of a few bridges, the reduction of certain grades, the filling of the approach (trestle) to Kansas City bridge and the improvement of the grounds, the erection of depot buildings and the perfection of terminal arrangements at St. Louis."

Illinois Central.

A Washington dispatch to the New York *Tribune*, after referring to the adjustment of the Government claim against the company by the payment of $63,188 instead of $96,636 as claimed, says: "The Illinois Central authorities have the satisfaction of knowing that the suit by which they resisted the payment of the assessment upon the dividends declared from the sales of land saved the company $27,125, and also disclosed the fact that they had needlessly paid the Government $241,904. This money cannot be recovered from the Treasury by any process of law, as the time within which it might lawfully be refunded expired by legal limitation on June 6, 1873. The only remedy for the company is by special act of Congress."

Lafayette, Muncie & Bloomington.

At Lafayette, Ind., Nov. 17, the Circuit Court refused the injunction asked by the Indianapolis, Cincinnati & Lafayette to prevent the Lafayette, Muncie & Bloomington road crossing its tracks in entering Lafayette. The case will probably go before the Supreme Court.

The Indianapolis, Cincinnati & Lafayette will also bring suit to recover $20,000 damages caused to its road by the crossing of the tracks by the new road at grade.

Chicago, Clinton & Western.

What exists of this road is being pretty well covered up by mechanics' liens filed by parties who have furnished supplies and labor for the road. The largest amounts are due the Joliet Iron & Steel Company for rails and joints, $75,274.19, and Wallbaum, Bridges & Co., bridge contractors, $48,500. These, with small claims filed by sub-contractors, bring the amount of the liens thus far up to $135,037. It appears that little or no money has been paid out for the work thus far done.

Cincinnati, Hamilton & Indianapolis.

The work of renewing this road and putting it in good condition has been nearly completed. Since March 1 there has been 31 miles of new iron laid, leaving but four miles of the road between Indianapolis and Hamilton that has not been relaid with new iron since the road was leased by the Cincinnati, Hamilton & Dayton Railroad Company.

Utica & Black River.

The track of the Morristown Extension is now laid to the terminus at Morristown, about seven miles beyond the late terminus at Brier Hill, N. Y., and 35 miles northeast from the junction with the Clayton Division at Theresa. As soon as regular trains are put on, the line from Carthage, where the Watertown Line diverges, to Morristown will be run as the main line of the division, the line from Theresa to Clayton being worked as a branch. Morristown is on the St. Lawrence, opposite Brockville, Ont., the Southern terminus of the Brockville & Ottawa road.

The company now has 172 miles of road in all, as follows: Utica, by Carthage and Watertown to Sacketts Harbor, 103 miles; Carthage to Morristown, 53 miles; Theresa Junction to Clayton, 16 miles. It has three northern termini, at Sacketts Harbor, at the foot of Lake Ontario, at Clayton and at Morristown on the St. Lawrence. Its lines are now substantially complete, unless the proposed extension from Morristown to Ogdensburg is built.

Chatham Branch.

Now that there is a prospect of the early completion of this road from the Intercolonial at Nelson, N. B., to Chatham, 8¾ miles, an effort is being made to secure the extension for two miles further to deep water on the Miramichi. The cost of this, including a wharf, is estimated at $37,000, of which $20,000 is to be raised by Government and local subsidy. The Dominion Government will give or loan the rails, as it has agreed to do for other branches of the Intercolonial.

Cumberland & Pennsylvania.

Vice-President Millholland will shortly remove the principal offices of this road from Mount Savage to Cumberland, Md.

Chesapeake & Ohio.

The Virginia Board of Public Works was to meet in Richmond last week, when the questions of whether the contingency has occurred in which the State shall take possession of its property in the road; whether the company has complied with its obligations as to the building of the road, and whether it has failed in so doing from maladministration were to be discussed. The fact as to whether the $3,500,000 stock required by the Virginia and West Virginia Commissioners was ever realized by the company was to be inquired into in its bearing on the question of forfeiture of the road.

St. Louis, Keokuk & Northwestern.

The contract for the grading the extension from Hannibal, Mo., to Louisiana has been awarded to Dewey & Co., of Litchfield, Ill., and that for the pile bridging to Craney & Co., of Dallas, Ill. The truss bridging has not yet been awarded.

Whitewater Valley.

The Indianapolis *Journal* says: "The Receiver of the Whitewater Valley road received his appointment from the courts, subject to the lease now existing between this company and the Indianapolis, Cincinnati & Lafayette Railroad Company."

The latter company will therefore continue to work the road, the only change, we believe, being that any rental becoming due will be paid to the Receiver instead of the company.

Boston & Providence.

The stockholders at the annual meeting last week re-elected the old board, and voted to authorize the purchase of stock in the Union Freight Railroad.

Concerning the recent reduction in the dividend rate, the Boston *Advertiser* says: "It will be remembered that the November dividend of the Boston & Providence Railroad was made 4 per cent., although the road had paid for a long time, semi-annually, 5 per cent. To those who inquired, it was also known that the Providence road had not reduced the wages of its men, and in that respect had stood alone among our Boston roads. It was a question in the minds of some whether its stockholders would have such a sense of justice as to give its directors their approbation in this respect. Of course it was very generally believed that a corporation with such an honorable record in its dealings with its men would do nothing now inconsistent with that.

"It was held by such persons that 9 per cent. in a year of heavy depression would be recognized by the stockholders as reasonable and sufficient, so that a suggestion to increase it by cutting down the wages of labor would be rejected as almost an imputation of dishonor. It will be gratifying to fair men, whether they have anything at stake in the decision or not, to know that, after a proposition to make a reduction had been made, the President of the road struck the true note when he intimated that, if that were to be the policy, his own compensation should be the first to be touched, and, further, that the meeting loudly applauded when the attempt was given up.

"Of course gentlemen who lead in such reductions, whether publicly or privately, are to be credited with generous dealing and public spirit. It is quite another thing to shirk the reductions upon the most dependent and poorest-paid portion of the employes, while the high dividends to stockholders remain unchanged. Officers who think this is good policy forget that it is the general faithfulness of the men which enables them to keep dividends as high as they are in many cases. They forget also that if, as they say, a lower price for provisions enables workingmen to live more cheaply than formerly, they share in the same privilege. The course of the managers of the Providence road in this has been courageous and conspicuous as it was honorable. It is quite safe to infer that there must be stockholders in other prosperous roads who, like those of the Providence, would rather accept the smaller dividend than take the larger, tainted with injustice, and for that reason impolitic."

Cleveland, Columbus, Cincinnati & Indianapolis.

This company has begun the erection of a new round-house at Brightwood, near Indianapolis, which is to be larger than any now in the West, and will be exceeded in size only by the large house at Altoona.

An express stock train was put on this week, which is to run from Indianapolis to Cleveland at an average rate of 18 miles an hour.

Lehigh Valley.

The new bridge over the Delaware between Easton, Pa., and Phillipsburg, N. J., is now completed, and the connection with the New Jersey Division made. Trains are using the bridge regularly.

Memphis & Knoxville.

Wayne County, Tenn., has voted a subscription of $125,000 to this projected narrow-gauge road, the money to be all expended on the road in that county.

Camden, Gloucester & Mt. Ephraim.

Work has been begun on the extension of this narrow-gauge road from the present terminus at Gloucester, N. J., to Mt. Ephraim, about three miles. The work is mainly light and only a short time will be required to complete it.

St. Joseph & Denver City.

The Purchasing Committee give notice that they have bought both divisions of the road at foreclosure sale on behalf of the subscribing bondholders and all others who may unite with them within 60 days by signing the reorganization agreement and paying their proportion of the necessary expenses. Further information can be obtained of the Secretary of the Committee, Thomas R. White, Jr., No. 52 Wall street, New York.

Terre Haute & Indianapolis.

At a meeting of managers held in Crestline, O., Nov. 17, the arrangement for pooling the earnings and business of this road and the Indianapolis & St. Louis were finally completed. Maj. John E. Simpson, General Superintendent of this road was chosen General Manager of the pooled lines between Indianapolis and St. Louis.

Shenango & Allegheny.

Work on the extension of 14 miles from Harrisville, Pa., to New Hope is progressing rapidly. The grading is nearly all done and the tracklayers have begun their work. As soon as the extension is done a third rail will be laid so that coal can be loaded in the Atlantic & Great Western cars at the mines, avoiding the transfer at the junction.

Rockford, Rock Island & St. Louis.

Receiver Ferry reports to the Court for October as follows:

Cash balance Oct. 1	$39,060 49
Receipts during October	65,332 41
Total	$104,392 90
Payments during October	51,806 98
Balance, Nov. 1	$52,585 92

The receipts exceeded the disbursements by $13,525.43. The Receiver asks an allowance of $1,000 for his services, for the month.

Montpelier & Wells River.

The suit of N. C. Munson to recover a balance of $250,000 alleged to be due under the contract for the construction of the road has been submitted, under the terms of the contract, to a board of five referees, who are George A. Merrill, of Rutland; S. S. Thompson, of Lyndon; James H. Williams, of Bellows Falls; Henry Edgarton and Edmund Thompson, of Boston. A hearing was to have been had last week, but was postponed, the company not being ready to proceed.

American Steam Vessels.

The annual report to the Secretary of the Treasury made by Mr. Wm. Burnett, Supervising Inspector General of Steam Vessels, gives the following figures:

The service employs 103 persons, 1 supervising inspector general, 10 supervising inspectors, 36 local inspectors of boilers, 36 local inspectors of hulls, 8 assistant local inspectors of boilers, 4 assistant local inspectors of hulls, 8 clerks to local inspectors. The cost of the service, salaries, traveling and incidental expenses, was $212,392.02, the receipts for inspection and license fees were $260,944.75, leaving a balance of $48,552.73. The number of vessels inspected was as follows during the fiscal year ending June 30, 1875:

Divisions:	Vessels inspected.	Tonnage.	Officers licensed.
Atlantic Coast	1,676	486,830.93	5,428
Pacific Coast	231	89,892.11	890
Western Rivers and Southern Coast	1,199	252,240.12	5,598
The Lakes	839	189,488.66	2,655
Totals	3,885	1,018,151.82	14,571

The number of lives lost during the year was 405, namely: From explosions, 51; fire, 273; snags, wrecks and sinking, 64. The number of accidents which resulted in loss of life were: Explosions or accidental escape of steam, 14; fires, 6; collisions, 5; snags, wrecks and sinking, 11; making a total number of accidents, 36. The Superintendent says to our own citizens the loss of life for the same period has been only 201, which is an unusually small number. While there were 36 disasters to steam vessels by which life was lost, a single one of these resulted in the loss of more than half the lives here recorded, viz., the burning of the steamship Japan at sea off Swatow, China, by which 200 Chinese and four other persons were destroyed. There were 14 cases of explosion or accidental escape of steam, one of which resulted in the death of 20 persons and another 6, while only 25 persons were lost by the remaining 12. There were six burnings of steamers by which life was lost; 204 were lost by one of these and 45 and 20 respectively by two others, while only four persons were lost by the remaining three.

North Brookfield Branch.

This road is now completed, the connection with the Boston & Albany made, and trains were to begin running Nov. 25. It is 4¼ miles long, from the Boston & Albany at East Brookfield to North Brookfield village. There is an up grade the whole distance from East to North Brookfield, the grade for a short distance being 116 feet to the mile. It was begun in July last, has cost about $95,000, and was paid for by the town. It will be worked by the Boston & Albany under lease.

Valley, of Virginia.

The commissioners of Botetourt County, Va., have offered to withdraw all litigation, to make provision for interest on the county bonds, to issue $45,000 more to the company at once, in addition to the $60,000 already out, and to issue the remaining $95,000 as soon as work is resumed, on certain conditions. These are that the company shall build a new bridge over the James River, or buy the present toll bridge and make it free; that it shall build a depot at Pattensburg and a branch or siding leading to it, and that it shall build a macadamized road from Fincastle to the nearest depot on the road.

An adjourned special meeting of the stockholders is to be held in Staunton, Va., Nov. 30.

Utah Northern.

Work is progressing steadily on the extension northward from Franklin, Idaho, and it is expected that the section of 25 miles will be completed before Spring. The road will not run through Marsh Valley as at first intended, but will turn eastward to within some twelve or fifteen miles of Soda Springs, and thence turning north, follows a tributary of Bear into the divide separating it from Snake River, whence an exploration survey party reports a practicable route down to the latter stream. The company hopes to be able to continue the extension through the Snake River Valley next year, and will ask the Montana Legislature for a subsidy this Winter.

Washington & Ohio.

Grading is still in progress from Round Hill westward towards Winchester, Va. A considerable force is employed on a heavy cut, which is nearly finished.

In Philadelphia, Nov. 19, a delegation of West Virginia capitalists and landholders held an informal meeting in reference to the extension of this road. Among those present were Col. John E. Wood, Hon. Alex. R. Boteler, and Hon. James D. Armstrong. Col. Wood had an interview with Col. Thomas A. Scott on the subject.

Delaware & Bound Brook.

The Chancellor of New Jersey has not fixed any time for further hearing in the Yardleyville Bridge injunction case.

In the matter of the grade crossing of the Mercer & Somerset road at Hopewell, affairs remain the same. The Pennsylvania Railroad Company refuses to allow the crossing frogs to be put in, and keeps a guard at the crossing.

Pittsburgh & Northwestern.

The Pittsburgh *Chronicle* says: "With the exception of the six miles to the northwest of Allegheny, this new road has been located definitely from Pittsburgh to Youngstown. The southwestern portion of Butler County and the northeastern part of Allegheny County will be particularly benefited. The Pittsburgh & Northwestern Railroad leaves Allegheny at Superior station, and taking off back of the river hills through Wood's Run, Bellevue, etc., crossing the Perrysville road near the Horse Shoe Bend, it pursues a northerly direction into Butler County, via Breakneck valley to the venerable and quaint town of Harmony. Within a mile and a half of Harmony the route turns into the little Connoquenessing, crossing Slippery Rock near Portersville, and reaching Youngstown by a line 75 miles from this city. Mr. Bird, formerly of the Allegheny engineer's office, has the surveying party in charge, and gives us to understand that the long-deluded neighborhood concerned can depend upon these roads being built this time for certain, and that work will be begun this winter in so far as possible."

It is intimated that the road is being built in the interest of the Lake Shore Company, which is somewhat improbable at present.

Newfoundland.

The St. John's (N. F.) *Express* says that the surveyors have returned to St. John's after completing the survey across the island, from the isthmus separating Trinity and Placentia Bays, to St. George's Bay, with the exception of 15 to 18 miles of the section extending from the isthmus to the valley of the Exploits, which Mr. Lynch, the surveyor of that section, was unable to complete, the provisions for his party having fallen short. In this break, however, it is not supposed that any engineering difficulty exists. The country is thickly wooded, and has all the appearance of there being a good railroad route through that short distance. The surveyors are now engaged on the survey from the Riverhead of St. John's to the isthmus, where it is supposed the engineering difficulties, although by no means formidable, are greater than in the interior, and it is anticipated that, with good weather, a short time will suffice to complete the field work.

There is no probability that the road will be built except as a Government work, and to that there is some objection on the ground of the large expenditure needed and the poverty of the island.

Valley, of Ohio.

At a meeting of friends of this road held in Cleveland, O., Nov. 18, a committee was appointed to determine upon a plan for disposing of the bonds of the company. It is stated that about $500,000 must be sold at 75 to furnish the means necessary to complete the road from Cleveland to Akron. The financial condition of the company is stated as follows:

Receipts from stock subscriptions	$687,434 06
Receipts from donations	5,000 00
Total	$692,434 06
Expended for right of way, grading, bridging, ties, engineering, etc	541,585 78
Balance of indebtedness	$149,161 72

The whole amount of subscriptions was $925,200, leaving $239,775.94 uncollected. The bonds now offered are first-mortgage bonds and are offered specially to stockholders.

The company has secured from the city of Cleveland a contract for the use of the abandoned portion of the Ohio Canal within the city limits. This secures it an excellent entrance into the city and access to good terminal facilities, especially for coal and ore traffic, which is expected to form a large part of the business of the road.

Burlington & Northwestern.

Contracts are now let for 14 miles of grading from Medeapolis, Ia., towards Winfield, and the intention is to have the line to Winfield ready for the iron in the spring. Beyond Winfield several routes are talked of, but nothing very definite has been done.

Report of the Purchasing Agents' Convention.

The following is the official report of the convention held last May, mention of which was made at the time:

The second annual convention of the Association of Railroad Purchasing Agents of the United States and Canada, was held at the Lindell House, St. Louis, on the 12th and 13th of May, 1875.

The officers elected for the ensuing years were: President, W. S. Cuddy, St. Louis & Iron Mountain Railroad; First Vice-President, I. T. Sterling, Toledo, Wabash & Western Railway; Second Vice-President, A. C. Armstrong, Lake Shore & Michigan Southern Railway; Secretary and Treasurer, E. W. Porter,

Canada Southern Railway; Executive Committee: G. C. Breed, A. V. Hartwell, E. V. Cherry, A. C. Armstrong, G. M. Babcock.

The President, on being conducted to his seat addressed the Convention as follows:

GENTLEMEN OF THE ASSOCIATION: The question has been asked, "Of what use is the annual meeting of purchasing agents?" We may with equal propriety ask of what use are the meetings of railroad, freight and ticket agents, conductors, editors, pork-packers and millers. When two purchasing agents meet, there is almost invariably a long, close, confidential conversation, in which comparisons are made as to the manner and method adopted by each in their style of doing business, the description of blanks used on each other's roads, the best articles known to either for certain specific purposes, and the merits and demerits of certain kinds of goods offered for sale, or in use on their respective roads; thus information is gained that is beneficial to them as purchasing agents, and is used for the benefit of the roads they represent.

Now the object of the Purchasing Agents' Convention is to bring about in a pleasant and social manner just such kind of meetings, only on a larger and more comprehensive scale, that we may know each other and mutually assist and strengthen each other in the discharge of the important trusts that are committed to our charge.

If there were only as many merchants in the United States and Canada as there are purchasing agents, say one hundred and fifty altogether, and these merchants were distributed as we are, only a few together in the larger cities and the others occupying isolated positions at considerable distances from any other in the same business, and if such merchants were selling a great variety of articles, from the size of a tack to a steam excavator, and selling them all over the country, would not such merchants naturally desire to meet together for information in the details of their business?

Now we are not selling, but we are buying from all parts of our whole country, and we are as a general thing isolated from each other, ignorant of the customs and usages of our fellow-workmen in the same important work, and hence the necessity of our meeting.

Some persons object to our holding conventions because they think it may cause difficulties between the purchasing agents and the superintendents and master mechanics; that in discussing certain questions we might take different and in some instances antagonistic views with these gentlemen, which would lead to some unpleasantness.

But with persons looking honestly and candidly into the motives that have prompted our organization, such objection can certainly have no foundation to rest upon. We do not propose to decide which is the best frog or the most reliable switch stand, or if a fire-box is safer or more economical when made of homogeneous steel or iron. None of the questions which it is customary for a superintendent or master mechanic to decide will have a place in our meetings, and hence we cannot understand how we are to have trouble with any of these gentlemen. On the contrary, we are of the opinion that, the objects of our meetings being known to be as purchasing agents for the benefit of purchasing agents, they will meet with the hearty approval and sympathy of the presidents and other officers of our roads.

The discussion of the question of wheel mileage and the contracts required of purchasing agents by their roads brought out the following resolution, which was unanimously adopted:

"*Resolved*, That this Association places its protest upon record against the present system of most roads of reporting freight-car mileage in aggregate instead of reporting each individual car, thus preventing us from perfecting contracts for car wheels based upon actual car-mileage; whereas if reports were made between roads of mileage of each car, it would be an easy matter to determine by actual mileage the worth of a wheel rather than by time, which may be unjust to either party to the contract."

The discussions upon the question of lubrication and reports of experiments with Ashcroft's machine were of special interest, as also the statistics presented with regard to actual results of certain makes of car wheels.

Resolutions of thanks to the merchants and manufacturers of St. Louis for their courteous and generous attention, to the proprietors of the Lindell Hotel for their kindness, to the Union Railway Transit Company and the St. Louis Fair Grounds Association for courtesies; and to the gentlemen of the St. Louis press for their report of the proceedings, and especially to the resident purchasing agents of St. Louis for their generous hospitality having been adopted, the Association adjourned to meet at Cincinnati on the 17th day of May, 1876.

The Edgar Thomson Steel Works.

Reference has been made in these columns to the very complete Bessemer plant of the Edgar Thomson Steel Company, Limited, (probably the best in the world for capacity of product and economy of operation), and to the very remarkable success attending its opening and operation during its first month.

That this success was not phenomenal, but that it was due to the thorough character of the plant, and the careful selection of its operating officers, made by the managers, is shown by the following statement of product, *from a single turn*, to Saturday, 13th inst., viz.:

During September (first month)	1112	1900-2240	tons rails.
" October (second month)	1817	1923-2240	"
" November (first week)	463	610-2240	"
" " (second week)	507	434-2240	"
Total product (ten weeks)	3901	387-2240	"

an out-put equal, proportionately to number of turns, to that of the oldest and best works in the country.

Included in the last week's production were seven rails 60 feet long for the Pittsburgh, Cincinnati & St. Louis Railroad Company, and four rails 41 feet 8 inches long for the Allegheny Valley Railroad Company, this works having made the first 60-feet *steel* rail rolled in the United States.

The rails produced have all been of the weight of 60 pounds per lineal yard, except 200 tons of 50 pounds per yard, and have been mainly furnished to the Northern Central Railway Company, the Pittsburgh, Cincinnati & St. Louis Railway Company, and the Allegheny Valley Railroad Company, while some have been shipped to Boston.

The furnaces of this city and the Mahoning and Shenango valleys are well known as furnishing the best Bessemer metal made in this country, and it is the declared policy of the managers to use only the best quality metal, as a result of which the second quality rails thus far made have been only about three (3) per cent. and of short rails (under 30 feet) less than eight (8) per cent.

These are, for a new works, extraordinary results, and we point with pride to the Edgar Thomson Steel Works as an Allegheny County institution, and one that does credit alike to its projectors, its constructors and its operating managers.

Its successful operation is greatly due to the large experience in Bessemer manufacture of Capt. Wm. R. Jones, General Superintendent of the works, and of Capt. Thomas H. Lapsley, Superintendent of rail mill, who have a force under them composed largely of men experienced in the manufacture of steel rails.

We learn from the officers of the company that the reports upon their rails from the inspectors and companies to whom they have been shipped have been uniformly to the effect that their quality was superior, and that for care in straightening and general appearance they were unsurpassed. We are pleased to chronicle such results, as evidences that what is worth doing at all is worth doing well.—*American Manufacturer, Nov.* 18.

LOCOMOTIVE RETURNS, AUGUST, 1875.

Master Mechanics of all American railroads are invited to send us their monthly reports for this table.

NAME OF ROAD.	Number of miles operated	Number of Locomotives in service	Mileage Total	Mileage Ave. age per Engine	No. Miles run to Ton of Coal	No. Miles run to Cord of Wood	No. Miles run to Pint of Oil	Average No. of freight cars hauled	Cost per Mile in Cents for Repairs	Fuel	Stores	Miscellaneous	Engine'rs, firemen, and wipers	Total	Av. c'st of Coal, per ton or bushel	Av. c'st of wood, per cord
															$	$
Atlantic & Great West'n (First & Second Div.)	228	81	224 997	2 778	47.00	.....	17.82	.....	4.00	4.86	0.55	0.66	6.23	16.30	2.13	3.13
" " (Third & Fourth Div.	208	49	108,521	2,215	47.00	.....	21.88	.....	5.57	4.86	0.40	0.81	6 00	17.64	2.13	3.13
" " (Mahoning Division)	80	54	135.713	2,513	47.00	.....	23.34	.....	3.27	4.86	0.45	0 48	5.98	14 99	2.13	3.13
Camden & Atlantic	67	12	29,118	2,427	55.48	.....	17.25	.....	0.75	10.14	1.11	.....	5 52	17.52	5.00	.....
Central Pacific (Western Division)	173.4	44	1 6.254	2,415	34.98	.....	14 07	.....	6.94	21.52	0.99	0.80	9.48	39.73	7.50	5.25
" " (Sacramento Division	119.5	39	96 650	2,478	.....	29.89	12.50	.....	10.99	17.56	1.10	1.07	8.8	39.51	.....	5.25
" " (Truckee Division)	204.5	26	63,844	2.456	38.13	27.55	14.52	.....	6 55	19.42	0.96	0.73	9.46	37.12	7.50	5 25
" " (Humboldt Division)	236.6	22	62.169	2 826	36 38	.....	15.16	.....	6.04	20.67	0 89	0.63	8.16	36.39	7.50	5.25
" " (Salt Lake Division)	182.8	26	76 646	2 945	37.34	.....	12.50	.....	9.59	20.16	1.08	0.47	7.67	38.94	7.50	5 25
" " (Oregon Division)	151.42	7	18 690	2,670	.....	40.28	16.55	.....	4.10	13.03	0.78	0.63	8 41	27.15	.....	5.25
" " (Visalia Division)	231.8	17	36 727	2.160	51.46	.....	15 09	.....	5.88	14.64	.92	0.59	8.7	30.75	7.50	5 25
Cleve., Col., Cin. & Ind. (Columbus Div.)	138	57	140,359	2 462	50.48	42.02	39.09	.....	3.26	4.77	0.53	.....	6.82	15.48	2 14	3.50
" " " (Indianapolis Div.)	207	62	165.401	2,668	51.01	52.05	28.89	.....	4.79	4.07	0.56	.....	6.72	16.14	1.75	3.50
" " " (Cincinnati Div.)	130	28	77,354	2,763	40 48	.....	28.97	.....	2.10	4.83	0.48	.....	6.46	13.87	1.75	3.50
Cleveland & Mahoning Valley	41	9	16,539	1 838	49.2:	.....	21.51	.....	0.64	4.32	0.31	1.06	5.59	11.92	1.91	2.74
Cleveland & Pittsburgh*	199	78	166,252	2,131	54.13	.....	19.44	16.50	2.54	2 97	0.68	2.45	6.92	15.54	1.32	1.66
Del., Lacka. & West. (Bloomsburg Div.)	80	24	64,960	2,665	.....	.....	8.55	.....	2.46	.....	0.68	.....	5.83	8.97	.....	.....
Hannibal & St. Joseph	294	55	129,818	2 360	42.90	.....	52.28	.....	4.70	6.20	0.40	.....	6.90	18.20	2.50	3.50
Illinois Central (Chicago Div.)†	252.5	61	149,716	2,454	41.78	.....	15.75	2 39	5.44	4.64	0.31	.....	6 74	17.16	1.80	4.25
" " (South Div.)†	230.75	32	69,781	2,181	45.75	.....	14.68	13.89	8.25	4.28	0.34	.....	6.56	19.43	1.8	4.25
" " (North Div.)†	225	43	94,283	2,191	38.54	.....	14.50	16.85	8 28	5.06	0.34	.....	6.65	0.33	1.80	4.25
" " (Iowa Div.)†	401	47	107,404	2.285	38.94	.....	18.67	12 36	5.33	6.18	0.:8	.....	6.41	18.20	2.50	4 75
Jeffersonville, Madison & Indianapolis	225	42	89,786	2,138	50.93	32.10	17.12	.....	5.32	5.59	0.45	2.27	7.05	20.68	2.50	2 75
Kansas Pacific, Main Line‡	673	86	154,256	1,794	35 03	.....	13 63	.....	3.48	8.71	0.48	.....	7.12	19.79	3.00	3.21
" including all branches‡	895	94	175.247	1,864	36 20	.....	13.85	.....	3.52	8.66	0.41	.....	7.27	19 86	3.07	3.53
Kansas City, St. Jo. & Council Bluffs‡	334	25	69,858	2,794	55 90	.....	24.70	19.90	6.50	6.00	0 50	.....	7 40	20.40	3.00	3 50
Lake Shore & Mich. South. (Buffalo Div.)¶	.....	92	139,956	1 521	44.36	44.87	13.58	.....	6.88	7.88	.....	.....	6.62	21.38	3.50	3.50
" " (Erie Div.)¶	.....	114	206 187	1,809	50.02	41.00	20.06	.....	5.52	7.14	.....	.....	6.51	19 17	3.5	4.00
" " (Toledo Div.)¶	.....	79	134,944	1,708	40.43	44.75	12.85	.....	4.88	9.70	.....	.....	6.03	20.31	4.00	4 00
" " (Mich. South. Div.)¶	.....	210	384.301	1,830	42.42	58.80	18.89	.....	5.10	8.78	.....	.....	7.09	20.87	4.50	3.50
Northern Central (Elmira & Canandaigua Div.)	147	47	108,783	2,313	35.44	.....	20.83	.....	5.54	6.68	0.60	.....	6.23	19.05	0.08	2.98
Pennsylvania (New York Division)	119.9	119	284,077	2 387	37.99	.....	11.74	.....	6.59	15.10	1.10	.....	.....	22.70	0.20	7.12
" (Amboy Division)	154.2	53	90,060	1,699	53 22	.....	15.48	.....	5 90	10.60	0.90	.....	.....	16.50	0.20	7.14
" (Belvidere Division)	102.5	36	77.763	2.160	40.59	.....	10.14	.....	2.40	13.90	1.40	.....	.....	17.70	0.20	7.16
" (West Jersey Railroad)	128	19	43,139	2,270	46.29	31.45	17.06	.....	5.20	11.80	0.70	.....	.....	17 70	0.20	3.68
" (Philadelphia Division)	204.3	173	455.934	2,635	33.65	.....	13 37	.....	7 20	5.20	0 90	.....	.....	13.3	0.06	3.50
" (Middle Division)	131.6	116	292,369	2 520	34.17	.....	21.46	.....	4.10	5.20	0.6	.....	.....	9.90	0.06	3.50
" (Pittsburgh Division, East End)	.....	71	142,494	2,007	25.80	.....	11.86	.....	9.50	6.70	1.00	.....	.....	17.20	0.06	3.50
" (Pittsburgh Division, West End)	.....	118	269,506	2,284	38.42	.....	14 : 3	.....	11.60	4.60	0.80	.....	.....	17.00	0.06	3.50
" (Tyrone Division)	106.8	26	52,199	2,008	27.63	.....	26.74	.....	8.00	6.40	0.50	.....	.....	14 9	0.06	3.50
" (West Pennsylvania Division)	103.6	25	53 514	2,141	42.13	.....	35 46	.....	3.90	4.30	0.40	.....	.....	8 60	0.06	3.50
" (Lewistown Division)	12.5	2	3,920	1,960	49.10	.....	5.67	.....	4.20	3.70	0.6	.....	.....	8.50	0.6	3 74
" (Bedford Division)	56.5	5	9.568	1,914	42.76	.....	23 09	.....	6.00	4.30	0.40	.....	.....	10.70	0.06	3.50
Philadelphia, Wilmington & Baltimore	.....	74	185,438	2.506	59.35	.....	10.47	.....	5.00	9.10	1.10	.....	7 00	22.20	4.75	5.00
Pitts., Fort Wayne & Chicago (Eastern Div.)*	468.9	179	398 503	2,226	44.13	.....	17.29	14.70	3.99	3.49	0.79	1.78	6.72	16.77	1 54	1 54
" " " (Western Div.)¶	280	103	260,787	2.532	52 97	.....	19.05	20.50	4.23	3.11	0.44	2.76	6.54	17.08	1.65	1.65
Pitts., Cin. & St. Louis (Little Miami Div.)	197	40	97.662	2.442	48.84	.....	12.60	.....	4.70	3.90	0.99	2.33	6.87	18.79	1.75	3.00
" " " (Pittsb. & Col. Div.)	224	90	220,588	2,451	33.60	.....	15.40	.....	7 23	4.33	0.79	2.96	6.65	21.96	1.3	3.50
South Carolina	242	30	61,254	2,042	.....	56 09	26.18	.....	6.50	4 23	0 71	.....	.....	11.44	.....	2.37
St. Louis, I. M. & South. (Arkansas Div.)	305	25	62,835	2.513	.....	50.50	16.10	.....	3.55	5.33	0.60	.....	6.98	16.46	.....	2.69
Stockton & Copperopolis	49	3	4,437	1,479	.....	56.16	16.25	.....	2.87	9.35	0.94	1.30	8.56	23.0	.....	5.25

* Five empty cars rated as three loaded ones.
‡ Switching and work train engines allowed 60 miles per day.
¶ Switching engines allowed 6 miles per hour.
† Two empty cars rated as one loaded one.
‖ Three empty cars rated as two loaded ones.

Master Mechanics' Association—Circulars of Inquiry.

The following circulars have been issued:

DEAR SIR: At the last meeting of the Association, the undersigned were constituted a committee on the

"CONSTRUCTION OF LOCOMOTIVE ENGINES,"

for the purpose of presenting to the convention at its next sitting any new methods of construction which experience has demonstrated to be real improvements.

In furtherance of this object, your Committee earnestly hope (their subject being general rather than specific), that all members who have made any positive improvements, coming within the scope of your Committee's subject, will present to us, as clearly and briefly as possible, a report of such improvements, detailing the exact method of construction, and wherein the improvement is positive and valuable.

It is to be hoped each member will contribute a statement of any improvements made, known to be of interest and value, and that no member of the Association will fail to respond, remembering the value of our report will depend upon the character of the information received.

Appended are questions with space following for the convenience of general replies.

JAMES SEDGLEY,
General Master Mechanic, L. S. & M. S. Ry.,
H. G. BROOKS,
President Brooks Locomotive Works,
WM. S. HUDSON,
Superintendent Rogers Locomotive and Machine Works,
HOWARD FRY,
Superintendent Machine Power, P. & E. Div., Pa. R. R.,
S. A. HODGMAN,
Master of Machinery, P. W. & B. R. R.,
Committee.

Address replies to JAMES SEDGLEY, Master Mechanic, L. S. & M. S. Ry., Cleveland, Ohio.

QUESTIONS.

1. What improvements have you made in the form and construction of locomotive boilers, particularly in reference to the saving of fuel?
2. What improvements in valves or machinery for working the same, resulting in a marked saving of fuel or repairs?
3. What improvements in the construction of locomotive trucks under front end of engines, and what advantage gained?
4. Have you found a perfect spark arrester or smoke consumer, meeting all requirements? If so, please give detailed description of same; length of time used, and with what results.
5. Have you had any experience with engines of either Fairlie's or Forney's design?

Do you consider the rigid wheel-base on average American engines sufficiently destructive to justify attempts to work out either of the designs referred to?

6. Please describe any improved methods of construction of locomotive engines, or any parts of the same, practicable and of real value, the knowledge of which would be of advantage to our fraternity generally.

LOCOMOTIVE TESTS.

The Committee on Locomotive Tests, who were appointed at the seventh annual convention of your Association, and who were instructed "to request members to make experimental tests to show the performance of locomotives, and to report the results to the Association," were obliged to report at the last convention that they had not received a sufficient number of replies to their circular to make a report. As the Committee was continued for another year, they renew the request made to members of the Association in previous circulars, to send reports of experimental tests made to determine the performance of locomotives. In the first circular the Committee issued, they gave somewhat full particulars of the kind of information which was desired. They will add that they want reports of *any* locomotive tests in which the performance, such as the amount of fuel consumed, water evaporated, load hauled, distance run, and speed of train is accurately recorded. Members who either have made, or will make such tests, are requested to forward records thereof to M. N. FORNEY, Chairman of the Committee, No. 73 Broadway, New York.

M. N. FORNEY,
R. H. THURSTON,
WM. WOODCOCK,
} Committee.

THE USE OF INJECTORS.

DEAR SIR: The undersigned Committee of the American Railway Master Mechanics' Association are requested to investigate and report upon the following subject:

"Is it economical to use injectors upon locomotives; and if so, to what extent?"

The Committee respectfully ask you to aid them by furnishing the following information:

1st. How many engines on your road have pumps and injectors? How many have pumps and no injectors? How many have injectors and no pumps?

2d. Which of the three foregoing arrangements do you prefer, and why do you prefer it?

3d. Does your experience prove the injector to be as reliable as the pump for supplying locomotive boilers with water?

4th. What is the cost of constructing and attaching one ordinary pump complete, as compared with that of one injector?

5th. What is the cost of keeping one pump in repair as compared with that of one injector?

6th. If possible, please give the average miles run to one ton of coal by engines using pumps exclusively; and also that of engines of same class, in same service, using injectors exclusively.

Replies to the foregoing are requested before March 1, 1876, and should be addressed to the Chairman of the Committee, E. T. JEFFERY, Assistant Superintendent of Machinery, Illinois Central Railroad, Chicago, Ill.

E. T. JEFFERY,
J. A. JACKMAN,
GEO. W. CUSHING,
} Committee.

Manufactures and Machinery at the Centennial.

The following is from a circular issued by the Director-General:

A number of Trade and Industrial Associations, which require large amounts of space, will be provided for in special buildings. Among these are the photographers, the carriage-builders, the glass makers, the cracker-bakers, the boot and shoe manufacturers, besides quite a number of individual exhibitors. The great demands for space will probably render this course necessary to a large extent, especially for exhibitors who have been tardy in making their applications. In the main exhibition building, for example, 333,300 square feet of space had been applied for by the beginning of October by American exhibitors only; whereas, the aggregate space which it has been possible to reserve for the United States Department, is only 160,000 square feet, about one-third of which will be consumed by passage ways.

The machinery building, like the others, is already fully covered by applications. There are about 1,000 American exhibitors in this department, 150 English, and 150 from other European countries—which is about 250 more than entered the Vienna machinery exhibition. Extra provision is being made for annexes to accommodate the hydraulic machinery, the steam hammers, forges, hoisting engines, boilers, plumbers, carpenters, etc.

Power in the machinery hall will be chiefly supplied by a pair of monster Corliss engines. Each cylinder is 40 inches in diameter, with a stroke of ten feet; the fly-wheel is 31 feet in diameter, and weighs 55 tons; the horse-power is 1,400, and the number of boilers is 20. This engine drives about a mile of shafting.

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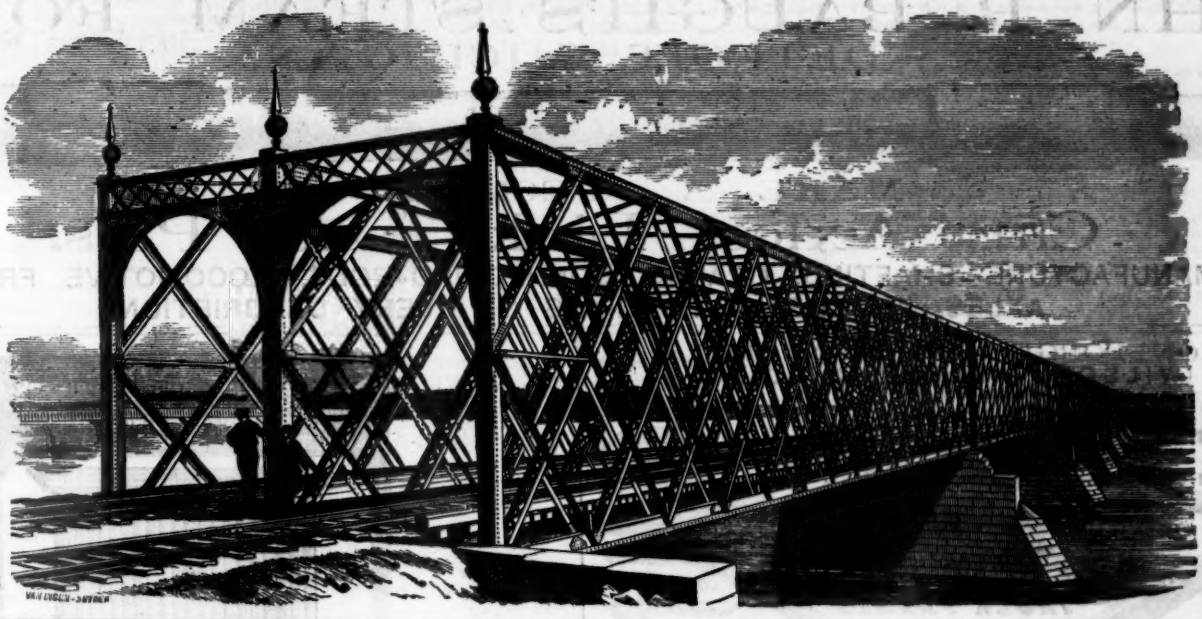

[Accompanying engraving represents the Springfield Bridge, built by the Leighton Bridge & Iron Works.]

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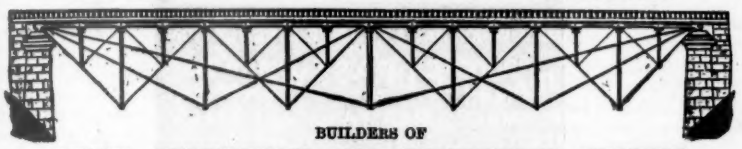

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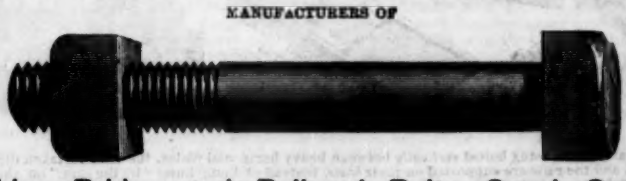

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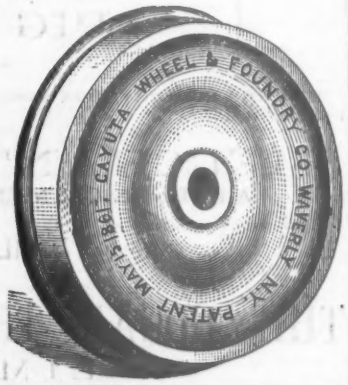

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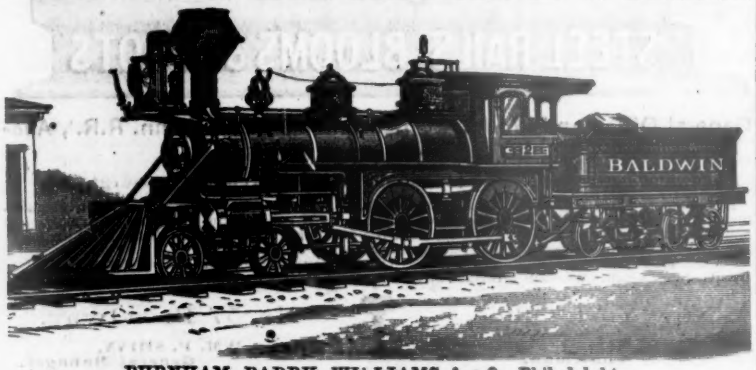

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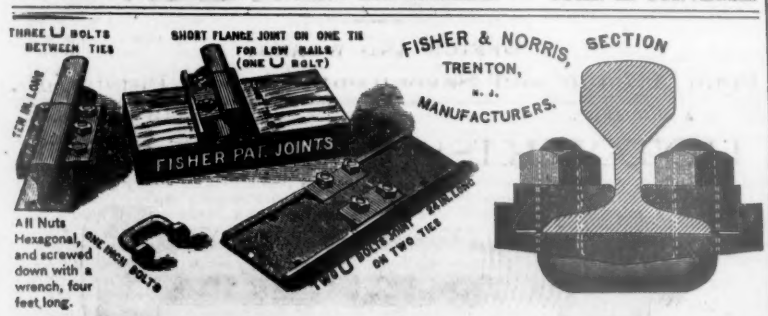
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